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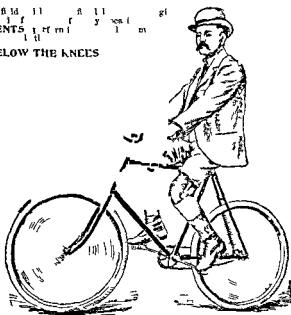
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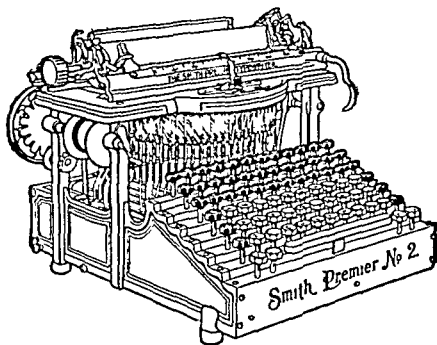
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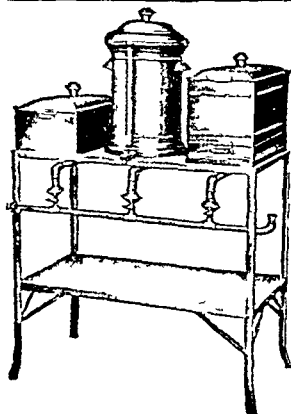
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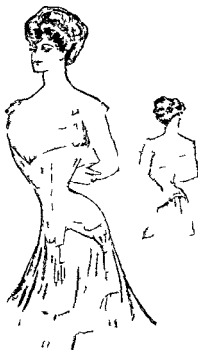
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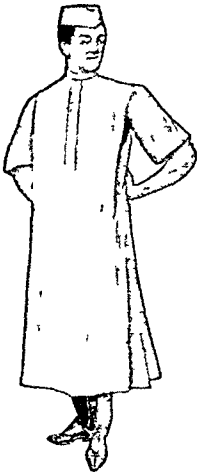
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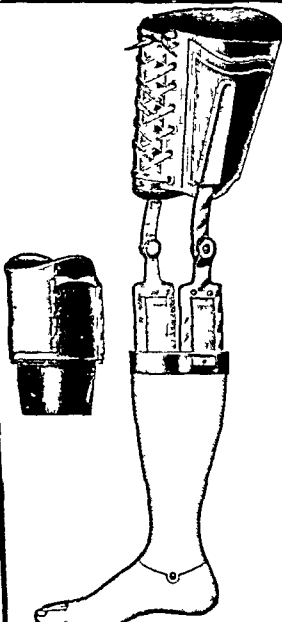
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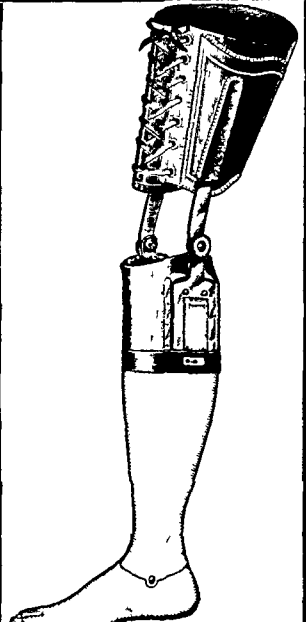
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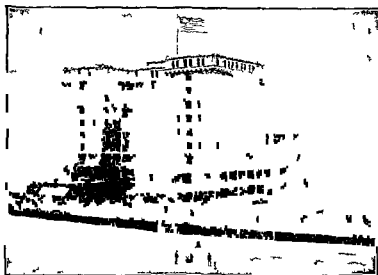
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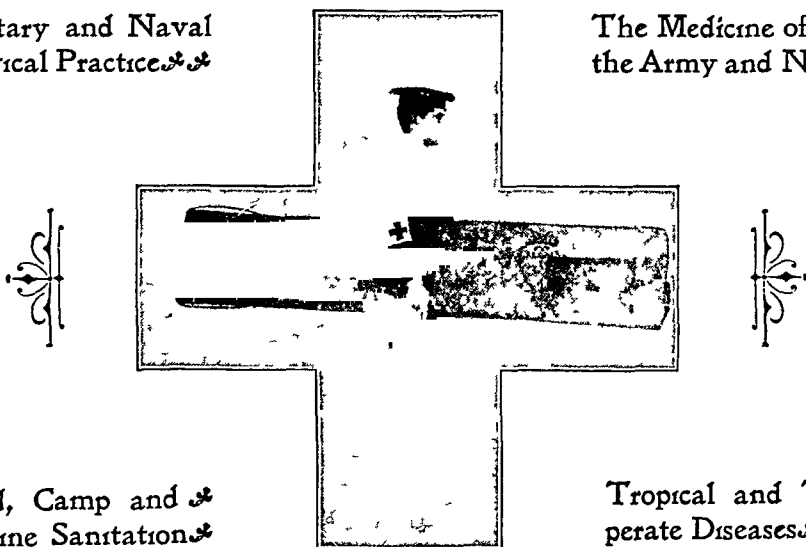
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James Evelyn Pilcher, M.D., Ph.D., L.H.D.,

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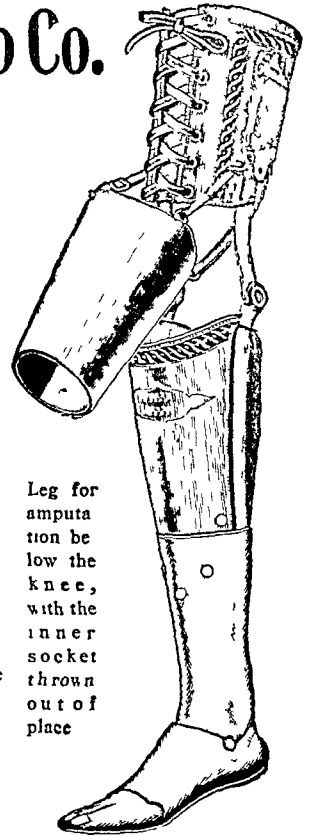
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# ANNALS OF SURGERY

VOL XLVI

JULY 1907

No 1

## ORIGINAL MEMOIRS

### THE RESULTS OF RADICAL OPERATIONS FOR THE CURE OF CARCINOMA OF THE BREAST \*

BY WILLIAM STEWART HALSTED M D

OF BALTIMORE MD

Surgeon J. H. Hospital

It is especially true of breast cancer that the surgeon interested in furnishing the best statistics may in perfectly honorable ways provide them. The most conscientious man may refuse to operate upon any but favorable cases and by performing an incomplete operation exclude from his list of complete operations such bad ones as he finds himself operating upon. Or the pathologist on whom he relies may classify as carcinoma tumors which on microscopic examination show dangerous spots—*i e* a few epithelial cells here and there escaping into the stroma.

But you will concede that little notion of the value of an operative procedure can be gained unless some attempt be made to exclude or consider apart cancers so far advanced that however radical the operation only a portion of the disease can be removed.

*The Results*—As effecting the ultimate result the variety of the cancer the time elapsed since its appearance the degree of outlying involvement the activity of the gland (lactation age of patient) the thoroughness of the operation are important factors.

---

\* Read before the American Surgical Association May 8 1907

There will not be time in this discussion to consider in detail each of these influences. It is the particular wish of the Society, as I have understood it, to learn the results obtained by the modern, so-called complete, operation for the cure of cancer of the breast, and it affords me the greatest pleasure to express anew my obligation to Dr Bloodgood for his efficiency and inexhaustible zeal in collating facts year after year for so many years, and to thank Mr Schapiro for his invaluable assistance in tabulating from many points of view our results. I am exceedingly indebted also to the many physicians who have ardently assisted us in the search for data concerning their patients.

I ask your attention to the Tables. According to the plan of operation the cases have been divided into five groups, of these only three concern us to-day. In Group I are the cases in which, at the one occasion, the complete subclavian and neck operations were performed, in Group II, the cases in which at the first operation the complete pectoral or subclavin, and at a second the supraclavicular or neck part was performed, in Group III, those in which only the complete pectoral operation was done, the neck being unexplored. The small letters, *a*, *b*, *c*, *d*, indicate, approximately degrees of axillary involvement, *a*, signifying that the base or lowest part only of the axilla was implicated, *b*, involvement of the midaxilla as well as of the base, *c*, involvement, in addition, of the highest glands of the surgical axilla, and *d*, that the subclavian vein was involved or intimately adherent to the glands.

In the Tables here presented are included only the cases in which nothing less than the complete subclavicular operation was done and only those operated upon three or more years prior to the last news received of them. Excluding 65 cases in which, necessarily, an incomplete operation was performed there remain for study of the cases operated upon at the Johns Hopkins Hospital 232. The result in 18 of these we have been unable to determine. In calculating the percentage of cures untraced cases should be figured as dead of the disease.

In Tables II and III the ultimate results are considered

in relation to the glandular involvement and in Table II in relation also to the particular operation performed. In 64 of the 232 cases glandular involvement was not discovered nevertheless in 15 of these (23.4 per cent) there was metastasis or recurrence of some sort sooner or later in 6 metastasis three years after operation. It is interesting to note how late the

TABLE I  
Carcinoma of the Breast—Pathologic Results

|                              | Number of cases | Cured  | P    |
|------------------------------|-----------------|--------|------|
| Carcinoma cyst               | 6               | 2 (1?) | 33.3 |
| Adenocarcinoma               | 3               | 24     | 75.0 |
| Medullary carcinoma          | 5               | 12     | 48.0 |
| Circumscribed scirrhous      | 8               | 13     | 46.4 |
| Small infiltrating scirrhous | 80              | 30     | 35.5 |
| Large infiltrating scirrhous | 39              | 8      | 0.5  |
| Total                        | 20              | 89     |      |

# SYMBOLS USED IN THE TABLES

Complete lymphatic operation { Group I: Simple gland, medial, total, p.  
Group II: Simple gland, medial, total, p.  
Group III: Simple gland, medial, total, p.

Let  $\delta$  denote axillary involvement

$\alpha$  Breast involvement  
 $\beta$  Basal involvement  
 $\gamma$  Breast involvement and p.  
 $\delta$  Venous involvement

metastasis occurred in these cases with undetected axillary involvement another argument for wide operating. Forty five of the 64 or 70 per cent of the cases with undemonstrated glandular involvement are tabulated as cured and 51 of the 64 or 80 per cent were free for three years from signs of the disease. We must bear in mind however that surely in some and probably in many if not in most of the axillæ recorded as negative there was disease.

Of 110 cases with axillary involvement and negative neck 27 cases or 24.5 per cent are cured for periods ranging from 16 to 3 years. Adding 11 untraced cases with axillary involvement to the 110 in which the result is definitely known

reduces the percentage of cures in this category to 22.4 per cent

The fact that in this country at least a number of the leading surgeons of the generation prior to mine made the pronouncement that they had not in their lifetime cured a single case of breast cancer notwithstanding the fact that they removed the entire breast, a liberal piece of skin, and after a fashion, some axillary glands, is strong presumptive evidence that in almost every instance the cancer, as then recognized, had entered the lymphatic vessels. As further proof of this is

TABLE II  
Carcinoma of the Breast—Cases operated upon 3 or more years  
prior to last news of them

| Ultimate result as affected by degree of<br>axillary involvement | Axilla<br>only involved |    |    |       | Axilla and Neck<br>involved |    |    |       | Totals |
|------------------------------------------------------------------|-------------------------|----|----|-------|-----------------------------|----|----|-------|--------|
|                                                                  | a                       | b  | c  | Total | b                           | c  | d  | Total |        |
| CURED, living 1906-1907                                          | 6                       |    |    | 6     |                             |    | 1  | 1     | 7      |
| CURED, living in 1905                                            | 3                       | 3  |    | 6     |                             |    |    |       | 6      |
| CURED, dead of other causes 3 years +                            |                         | 2  | 2  | 4     | 1                           | 1  |    | 2     | 6      |
| CURED, dead of other causes 3 years —                            |                         |    | 1  | 1     |                             |    |    |       | 1      |
| Actual cures                                                     | 9                       | 5  | 3  | 17    | 1                           | 1  | 1  | 3     | 20     |
| WELL 3 years, metastasis later                                   | 1                       | 4  |    | 5     |                             | 1  | 1  | 2     | 7      |
| Cured 3 years and over                                           | 10                      | 9  | 3  | 22    | 1                           | 2  | 2  | 5     | 27     |
| DEAD, local recurrence                                           | 1                       | 3  | 3  | 7     | 1                           | 6  | 1  | 8     | 15     |
| DEAD, regional recurrence                                        | 5                       | 4  | 6  | 15    | 2                           | 7  | 2  | 11    | 26     |
| DEAD, internal metastasis                                        | 5                       | 13 | 5  | 23    | 1                           | 9  | 5  | 15    | 38     |
| Cases not cured                                                  | 11                      | 20 | 14 | 45    | 4                           | 22 | 8  | 34    | 79     |
| Cured 3-year cases                                               | 10                      | 9  | 3  | 22    | 1                           | 2  | 2  | 5     | 27     |
| Postoperative deaths                                             |                         |    |    | 3     |                             |    |    | 1     | 4      |
| Untraced                                                         |                         |    |    | 11    |                             |    |    | 3     | 14     |
| No data as to extent of axillary involvement                     |                         |    |    | 43    |                             |    |    | 1     | 44     |
|                                                                  | 21                      | 29 | 17 | 124   | 5                           | 24 | 10 | 44    | 168    |

our observation that even in the cases with microscopically negative axilla, and notwithstanding our extensive operation, there is death from metastasis in 23.4 per cent

Fortunately we no longer need the proof which our figures so unmistakably give that the slightest delay is dangerous and that, other things being equal, the prognosis is quite good in the early stage of breast cancer, two in three being cured, and bad, three in four succumbing, when the axillary glands are demonstrably involved. We find encouragement for our operative

TABLE III  
 C m f the Breast — C p ted po 3 mo e years p t l t e s of th m

| U l m                                               | I  | ff | d by ax il l y d k | I m | G l a d f k m o e y e a r s p t l t e s o f t h m |    |     |   |                                                   |    |     |   |                                                   |     | T o t a l |    |
|-----------------------------------------------------|----|----|--------------------|-----|---------------------------------------------------|----|-----|---|---------------------------------------------------|----|-----|---|---------------------------------------------------|-----|-----------|----|
|                                                     |    |    |                    |     | G l a d f k m o e y e a r s p t l t e s o f t h m |    |     |   | G l a d f k m o e y e a r s p t l t e s o f t h m |    |     |   | G l a d f k m o e y e a r s p t l t e s o f t h m |     |           |    |
|                                                     |    |    |                    |     | I                                                 | II | III | T | I                                                 | II | III | T | I                                                 | II  | T         |    |
| C u r e d l o c a l l y                             |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   |                                                   |     |           |    |
| CURED l v g h d f m 1906 1907                       | 4  | 1  | 20                 | 5   |                                                   |    |     |   | 4                                                 |    |     |   | 5                                                 | 9   |           | 35 |
| CURED l v g h d f m 1905                            | 4  | 2  | 7                  | 13  |                                                   |    |     |   | 4                                                 |    |     |   | 3                                                 | 7   |           | 20 |
| CURED d e d f t h c a s e m t h 3 y r s p s t p     | 4  |    | 3                  | 7   |                                                   |    |     |   | 4                                                 |    |     |   | 3                                                 | 7   |           | 16 |
| CURED d d f t h c a s e l t h 3 y a r s p o t p     |    |    |                    |     |                                                   |    |     |   | 1                                                 |    |     |   | 3                                                 | 4   |           | 4  |
| C a s e s a c t u a l l y c u r e d                 |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   |                                                   |     |           |    |
| CURED 3 y e a r l i f e o p e t o m e t t s l t e   | 12 | 3  | 30                 | 45  | 13                                                |    |     |   | 13                                                |    |     |   | 14                                                | 7   |           | 75 |
|                                                     | 1  |    | 5                  | 6   | 3                                                 |    |     |   | 3                                                 |    |     |   | 4                                                 | 7   |           | 14 |
| C a s e s c u r e d n o t l e s t h a n 3 y e a r s |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   |                                                   |     |           |    |
|                                                     | 13 | 3  | 35                 | 5   | 16                                                |    |     |   | 16                                                |    |     |   | 18                                                | 34  |           | 89 |
| D E A D l o c a l l y                               |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   |                                                   |     |           |    |
| DEAD e g g o r y e c u r r e n c e                  | 1  |    | 3                  | 4   | 13                                                |    |     |   | 5                                                 |    |     |   | 11                                                | 6   |           | 6  |
| DEAD t m l m t a s                                  | 2  |    | 3                  | 5   | 15                                                |    |     |   | 13                                                |    |     |   | 1                                                 | 21  |           | 35 |
|                                                     |    |    |                    |     |                                                   |    |     |   | 15                                                |    |     |   | 1                                                 | 39  |           | 60 |
| C a s e s t h a t h a v e n t b e e n c u r e d     |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   |                                                   |     |           |    |
| C e c u d 3 y e a r s a n d m o r e a s a b o v e   | 3  |    | 6                  | 9   | 33                                                |    |     |   | 33                                                |    |     |   | 2                                                 | 4   |           | 1  |
|                                                     | 13 | 3  | 35                 | 51  | 16                                                |    |     |   | 16                                                |    |     |   | 18                                                | 34  |           | 89 |
| T o t a l p r o p o r t i o n M o r t a l i t y     |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   |                                                   |     |           |    |
| Untraced                                            | 16 | 3  | 41                 | 60  | 49                                                |    |     |   | 49                                                |    |     |   | 59                                                | 110 |           | 2  |
|                                                     |    |    | 4                  | 4   | 3                                                 |    |     |   | 3                                                 |    |     |   | 1                                                 | 3   |           | 4  |
|                                                     |    |    |                    |     |                                                   |    |     |   |                                                   |    |     |   | 8                                                 | 11  |           | 18 |
|                                                     | 6  | 3  | 45                 | 64  | 54                                                |    |     |   | 54                                                |    |     |   | 2                                                 | 68  |           | 23 |



and laboratory labors and to increased endeavor quite as great from the relatively poor results obtained in the advanced cases as from the more favorable outcome in the cases in which no involvement of lymphatic glands was detected

The neck operation was done in 101 cases primarily and in 18 secondarily. In 113 of the 232 cases the supraclavicular operation was omitted. In 44 patients the glands of the neck as well as of the axilla were involved. Three of these, or 7 per cent, were, it seems, definitely cured. One is still living, twelve and a half years since the operation, a second lived six years and died of diabetes, a third, three and three-quarter years without signs of return, died of acute pneumonia, and in a fourth, after three years of apparent freedom, the disease re-manifested itself. We have reason to be quite certain that there

TABLE IV

Carcinoma of the Breast — Study of cured 5-year cases (To January, 1907)

|           | Cases | P O D<br>and lost | No of<br>cases | Cured,<br>living | Cured<br>dead | Metast<br>after<br>5 years | Total | Per<br>cent |
|-----------|-------|-------------------|----------------|------------------|---------------|----------------------------|-------|-------------|
| Group I   | 96    | 8                 | 88             | 13               | 6             | 5                          | 24    | 27 27       |
| Group II  | 16    |                   | 16             | 3                | 1             | 1                          | 5     | 31 25       |
| Group III | 92    | 5                 | 87             | 23               | 3             | 4                          | 30    | 34 48       |
|           | 204   | 13                | 191            | 39               | 10            | 10                         | 59    | 30 89       |

was also involvement in some of the necks reported as negative

Before accepting the statement of any one that he has cured a case of breast cancer with neck involvement, incontrovertible proof should be demanded. I confess that even if the microscopic findings were confirmed by an able pathologist I should still feel that an error might have occurred, for example, in the labeling of the specimen. The naked eye diagnosis of the surgeon should count for nothing unless he is a sound pathologist and the macroscopic findings are specifically detailed. Inflammation may produce appearances in lymphatic glands quite indistinguishable macroscopically from carcinoma, whether medullary or scirrhous. If the deposit is described as sharply outlined against the more normal portions of the gland, particularly if cortical, the observation deserves consideration. We

should demand as further proof of cure in these positive neck cases that the patient live at least five years after the operation or negative autopsy findings a year or perhaps even two years thereafter. With these stipulations fulfilled I should still be sceptical as to the cure. Cancer was diagnosed both macroscopically and microscopically in the three cases of cure claimed by us. But even without the proof which we offer it is I think incumbent upon the surgeon to perform in many cases the supraclavicular operation. He should surely perform it barring of course special contraindications (1) in all cases with palpable operable neck involvement (2) when the apex of the surgical axilla is involved. When midaxillary involvement is demonstrable at the operation apical implication is almost certain and hence (3) in these cases also the neck should be typically cleaned of its lymphatics as high at the very least as the bifurcation of the carotid.

We find ourselves for the past two years again performing the neck operation in most cases. We omit it in hopeless cases in most duct cancers and in some carcinomata of emphatically adenomatous type in which the axilla at operation is not macroscopically involved.

To determine the relation of supraclavicular to subclavicular involvement detailed observations at the operating table with especial reference to this point must be made and almost endless laboratory work is necessary. To be able to assert with any degree of positiveness that the axilla and neck are negative involves infinite toil. The findings at operation must be recorded on charts designed especially for this purpose and a laboratory enthusiast of a rare type is indispensable.

For the greater convenience of the reader the following summary is given. Of the 232 cases considered 18 remain untraced. Of the 210 traced cases we accept as *cured*

|                                                                                                                  |                       |
|------------------------------------------------------------------------------------------------------------------|-----------------------|
| 35 cases reported living in 1906-1907                                                                            | 16.6 per cent. of 210 |
| 70 cases reported living in 1905                                                                                 | 9.5 per cent. of 10   |
| 16 cases known to have died of causes other than carcinoma of the breast three or more years after the operation | 7.9 per cent. of 210  |

4 cases dead of other disease, less than  
three years post op, in which the cure  
was demonstrated by autopsy 19 per cent of 210

—  
Total, cured, 75 cases = 32.3 per cent of 232, and 53.6 per cent. of 210

In 14 cases metastasis appeared after three years, in one instance manifesting itself as late as eight years and in two instances more than six years after the operation. Thus, 89 cases (42.3 per cent of 210, and 38.3 per cent of 232), were apparently cured for three or more years.

In the 210 traced cases the condition of the axilla and neck as regards glandular involvement was as follows

|                                |           | Cured | Per cent | Cured<br>3 years | Per cent |
|--------------------------------|-----------|-------|----------|------------------|----------|
| Axilla and neck negative       | 60 cases  | 45    | = 75     | 51               | = 85     |
| Axilla positive, neck negative | 110 cases | 27    | = 24.5   | 34               | = 31     |
| Axilla and neck positive       | 40 cases  | 3     | = 7.5    | 4                | = 10     |
| Total                          | 210       |       |          |                  |          |

*The Mortality*—Four of the 232 patients died in the hospital, a mortality of one and seven-tenths per cent. The group apportionment of the deaths is as follows

|            |                          |              |                |
|------------|--------------------------|--------------|----------------|
| Group I,   | in 101 cases, 3 deaths = | 3 per cent   | } 2.5 per cent |
| Group II,  | in 18 cases, 0 deaths =  | 0 per cent   |                |
| Group III, | in 113 cases, 1 death =  | .88 per cent |                |

Thus it would seem, without particulars, that the neck operations were responsible for the greater mortality, Groups I and II yielding a two and one-half per cent death rate, and Group III, in which the neck operation was omitted, a mortality of hardly one per cent. But two of the deaths in the neck cases were clearly due to an avoidable error, quite independent of the operation. These two patients, operated upon just twenty-four hours apart, were convalescing normally until the first dressing, which was made in both cases the same day and hour, respectively eight and nine days after the operation. Within a few hours of the dressing each patient had a chill with high temperature. The skin grafts and wound, which in each had a perfectly normal appearance at the time of the dressing,

rapidly acquired the features so characteristic of general infection. Excepting these two cases the mortality in the patients with neck operation becomes 99 per cent only a shade more than in the cases with axillary operation alone in which it is 88 per cent.

*Recurrence and Metastasis*—We know little of what is going on under the skin along the fascial planes even when our attention is drawn to the disease by the appearance here and there of cutaneous or subcutaneous nodules at long distance from the primary tumor. I recall distinctly one case and less distinctly one or two other cases of intestinal and peritoneal cancer in which general metastasis was believed erroneously I think to have occurred by way of the blood vessels although the only evidence of metastasis were numerous subcutaneous and fewer cutaneous nodules situated chiefly over the abdomen and confined altogether to the trunk or to the trunk and its immediate vicinity. Although it undoubtedly occurs I am not sure that I have observed from breast cancer metastasis which seemed definitely to have been conveyed by way of the blood vessels and my views as to the dissemination of carcinoma of the breast accord so fully with Handley's<sup>1</sup> that I may in justice to him who has formulated and expressed them so well quote now and again from his admirable chapters. In showing that cancer cells in the blood excite thrombosis and that the thrombus as it organizes usually destroys or renders them harmless Goldmann and Schmidt seem to have established a fact of primary importance and one which is strongly opposed to the embolic theory as applied to carcinoma. We believe with Handley that cancer of the breast in spreading centrifugally preserves in the main continuity with the original growth and before involving the viscera may become widely diffused along surface planes.

Statistics obtained from many sources indicate that bone metastasis in cases of breast cancer occur as phrased by Handley very rarely in areas not actually invaded by the subcutane-

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Handley. Cancer of the Breast and its Operative Treatment. London 1907 (W. Sampson)

ous nodules As is well known, the sternum, ribs, spinal column, femur, and humerus, and perhaps also the skull, are the bones most frequently attacked in cases of breast cancer Distal to the elbow and knee the bones escape, except in rare instances, cancerous invasion We have in our cases no record of bone involvement below these joints "The liability of a bone to cancerous metastasis increases with its proximity to the site of the primary growth" Figs A and B (Handley) graphically represent the coincidence of the areas liable, respectively, to bone metastases and to subcutaneous nodules

In that metastases occur both in general and in the special case only in bones which lie in the area invaded by subcutaneous nodules there is signified a relationship between the two, "between the bone deposits and the subcutaneous nodules" The dissemination probably takes place by way of the lymphatics—not by the blood-vessels—and the disease holds together without important interruptions It permeates to the bone rather than metastasizes to it, and, via the lymphatics, along fascial planes Much evidence has been adduced by others, and most convincingly by Handley, to indicate that the centrifugal spread of breast cancer takes place primarily in the plane of the deep fascia If the bones are invaded by way of the lymphatic plexus of the deep fascia the first attack should fall on the spot nearest the deep fascial lymphatics—nearest the surface, in the case of the femur, at the great trochanter, of the humerus, at or below the insertion of the deltoid, and such seems actually to be the case<sup>2</sup>

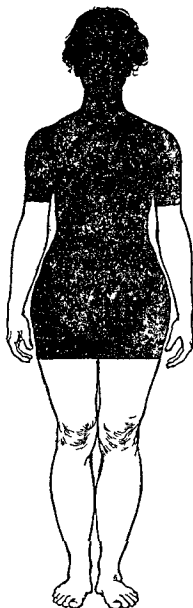
There is then a definite, more or less interrupted or quite uninterrupted, connection between the original focus and all the outlying deposits of cancer, "the centrifugal spread annexing by continuity a very large area in some cases" Thus the liver may be invaded by way of the deep fascia, the linea alba and round ligament,<sup>3</sup> "the brain by the lymphatics accompanying the middle meningeal artery"

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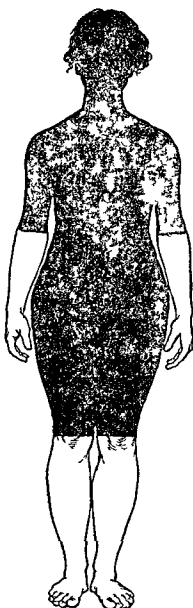
<sup>2</sup> Handley, loc cit

<sup>3</sup> Handley furnishes convincing proof that the liver may be invaded via the linea alba and round ligament

C I



A



B

D gram h w g h m m l d t b t eas f bc ta eo od les d f  
 ru t tas i bo ca es f m mm ry i m Th bla k ea A th ea i bl  
 t b ta eous od les that Blsth wi hl whi h bo m t ta es H dly

*Cancer Cysts*—At some other time we may consider in detail the cancer cysts, but at present can only speak of the difficulty in recognizing them and the hopelessness of the prognosis if their character is not suspected by the surgeon at the operating table. "By the surgeon," I say, for unless the operator espies the hardly discernible changes in the delicate wall of the cyst it will not occur to him that it is worth while to submit a piece for immediate examination by the pathologist. If he is able to recognize the barely perceptible thickening, the slight lack of lustre, the faintest possible difference in color and in texture, he will probably make the diagnosis without microscopic assistance. Blood-stained fluid should arouse one's suspicions, but there may be no staining of the cyst-content. Every portion of the wall should be scrutinized, particularly the base of the not infrequent papilloma. The prognosis is quite hopeless if the diagnosis is not made at the operating table. I failed to make it in the first case and possibly in the second, although I have the impression that my suspicions were aroused in the second case, operated upon many years ago. In all the clinically undiagnosed cases the nature of the cyst was soon discovered by the microscope, and in all, more or less promptly, a second operation performed, but, alas, performed in vain. The cases saved are only those in which at the operating table the correct diagnosis was made. Further proof of the necessity of making the correct diagnosis at the time of operating is not needed. The prognosis in these cases of cancer cyst, the earliest recognizable cancers, perhaps, is excellent if the nature of the disease is perceived at the table, hopeless, so far as our statistics are concerned, if it is not. Do we require more definite proof than this that the first operation is responsible for the inefficacy of the second? The precise means by which the first renders the speedily following second operation futile is not perhaps altogether clear. The partial operation (the first) certainly disseminates the cancer, which the complete operation (the second) in the primarily diagnosed cases of cancer cyst has not in our experience done. Furthermore, dissemination takes place probably by routes not already

travelled by the cancer cells and not commonly travelled by them in the early unoperated cases. Probably by these unusual routes the disease soon reaches parts outside the domain of the operation and so escapes eradication.

*The Diagnosis*—It is not expected of me in this report to touch upon the diagnosis of breast cancer; furthermore it is considered a trite subject one to which little can be contributed. But for me interest in the diagnosis of difficult cases increases and with it the conviction that really something remains to be said and done. It well repays the experienced surgeon to spend perhaps an hour in the examination of certain breasts. The diagnosis has usually been exceedingly and unfortunately simple. But women are now presenting themselves more promptly for examination realizing that a cure of breast cancer is not only possible but if operated upon early quite probable. Hence the surgeon is seeing smaller and still smaller tumors, cancers which give not one of the cardinal signs. About as difficult a case as any excepting of course the adenoma in a transitional stage is a tiny retromammary adenocarcinoma or a colloid carcinoma in a breast covered with one or more inches of fat. If in such a case there should be no shortening whatever of the trabeculæ the diagnosis could hardly be made. The fat on pressure being elastic and the tumor so deep the differential diagnosis from cyst might not be possible. But given even very slight shortening of the trabeculæ from tumor to skin this fact might be determinable by making both breasts take the widest possible excursions on the chest wall under the skin. The faintest conceivable trace of a difference on the two sides in a minor pectoral crease for example may suffice for the diagnosis. Raising the skin over the tumor with the fingers to ascertain the relative length of the trabeculæ is too crude a method and in no case serviceable unless the tiny growth is directly under or close to the nipple for if the test applied in this way gives a positive result there is so much shortening of the trabeculæ that the slightest displacement of the breast would reveal it. I have occasionally noticed that of my assistants perhaps one



or two will see a trace of asymmetry in the skin tug on extreme displacement which the others are wholly unable to make out, and I have more than once in just such case of difference of opinion performed the complete operation for very small, deep-seated cancers without exploratory incision. Frequently there is no sign but this almost imperceptible suggestion of pull, which, when the faintest possible, is of course elicited by dislocation in one direction only. This sign, however slight, is all that is needed for the diagnosis. Practice in the examination of such cases, doing one's utmost to get such evidence, is most highly rewarding. Any breast if displaced far enough will, of course, tug, in a way, on the skin, it is only under the most accurate control with the other breast that its significance in difficult cases may be estimated. It will seem to some that I am wasting many words to tell what every surgeon knows, but to me, at least, the extreme possibilities of this test were not fully realized a decade, perhaps, ago, and each year I believe it develops a little in refinement. The ability to determine elasticity, the elasticity of a small cyst, as hard, almost, as bone, comes to some earlier than to others, but to me, if it has come at all, it came only with long practice. In the breast a difficulty arises from the fact that a tense cyst makes itself felt such considerable distance in the surrounding mammary tissue, particularly if the breast is very fibrous. A nodule seemingly as large as a pea to palpation may be caused by a cyst no larger than a small pin-head, and a cyst almost microscopic may, by the pressure which it exerts in the dense fibrous tissue of the breast, occasion a definitely palpable, quite circumscribed hardness. It should impress the uninitiated to witness the ability of the demonstrator to diagnose with the fingers through considerable fibrous tissue these hardly visible cysts yielding on puncture the tiniest fraction of a drop. The general nodular feel of a fibrous mamma in situ or on a tray depends largely upon small to tiny foci of parenchyma which are most readily recognized by the finger when a little fluid (the minutest particle suffices) is retained under tension.

The firm circumscribed pressure exercised in the effort to determine the elasticity of a tumor occasionally ruptures. I believe the capsule of a fat lobule. In three instances while making this test a peculiar sensation has been communicated to the fingers which I attributed in the first instance and with considerable apprehension to rupture of a cystic portion of a colloid cancer which I believed to be under examination. The cause of this perfectly unmistakable sensation which must one feels be accompanied by a nonaudible sound (onomatopoeically *gerausch*) we have been unable definitely to determine. It is due to the crushing or rupture of something certainly not of a cyst and I have noted this sign only in fat people.

The size of the breast relative to that of the other side should of course be determined but it is important to note most carefully the relative amount of uninvolved mammary gland remaining—relative to the amount in the other breast and to the size of the new growth.

Given a carcinoma say one half or one quarter as large as the palm of the hand if this tumor has grown not at all or little at the expense of the breast—and this is ascertained by making the comparison just advised—the prognosis is relatively good for the tumor in such case is quite surely of a definitely adenomatous type and not of the scirrhus variety.

There can be little doubt in my opinion that a scirrhus cancer represents only a part of what has existed. The struggle against the cancer cells resulting in fibrous tissue production is quite surely not always futile and when the minute foci of cancer epithelium have been destroyed the new fibrous tissue may in part be absorbed also. Thus the scirrhus disease may be active and metastasis take place a long time before the visible or palpable tumor is developed. It would undoubtedly be possible for the expert to discover of the scirrhus growth earlier stages than he encounters but unfortunately the tumor must first be recognized by the patient and a scirrhus cancer large enough to attract her attention has quite surely already gone afield. Our problem therefore is to discover these tumors before the afflicted one can do so. Shall we let women

know that a dangerous process may be going on which they cannot detect, and keep them in a constant state of apprehension, or shall we encourage them to seek "expert" advice which may be insufficiently expert, and expose them to the annoyance of repeated and useless examinations, each of which for only a brief period, if at all, would bring a measure of reassurance?

*The Operation* — Though the area of disease extend from cranium to knee, breast cancer in the broad sense is a local affection, and there comes to the surgeon an encouragement to greater endeavor with the cognition that the metastases to bone, to pleura, to liver, are probably parts of the whole, and that the involvements are almost invariably by process of lymphatic permeation and not embolic by way of the blood. Extension, the most rapid, taking place beneath the skin along the fascial planes, we must remove not only a very large amount of skin and a much larger area of subcutaneous fat and fascia, but also strip the sheaths from the upper part of the rectus, the serratus magnus, the subscapularis, and at times from parts of the latissimus dorsi and the teres major. Both pectoral muscles are, of course, removed.

A part of the chest wall should, I believe, be excised in certain cases, the surgeon bearing in mind always that he is dealing with lymphatic and not blood metastases and that the slightest inattention to detail, or attempts to hasten convalescence by such plastic operations as are feasible only when a restricted amount of skin is removed, may sacrifice his patient.

It must be our endeavor to trace more definitely the routes travelled in the metastases to bone, particularly to the humerus, for it is even possible in case of involvement of this bone that amputation of the shoulder joint plus a proper removal of the soft parts might eradicate the disease. So, too, it is conceivable that ultimately, when our knowledge of the lymphatics traversed in cases of femur involvement becomes sufficiently exact, amputation at the hip joint may seem indicated. The operation might with advantage be considered in greater detail, and I hope in the near future to have the opportunity to do so.

As to the closure of the wound I should not care to say  
Beware of the man with the plastic operation The surgeon should familiarize himself with the principle of the one or two particular plastic operations which make the best use in the simplest manner of any redundant or easily glideable skin as of the axillary flap that he may be prepared in any case to utilize in combination with skin grafting such feature as seems applicable But to attempt to close the breast wound more or less regularly by any plastic method is hazardous and in my opinion to be vigorously discountenanced The oval flap whatever the direction of its long axis removes so far as the cure of the disease is concerned a circle of skin whose diameter is not greater than the short axis of the oval I still believe in the removal of a very large circle of skin and endorse the remark of my ex house surgeon Dr Follis that the operator whose duty it is to close the wound should not be entrusted with the planning of the skin incision Skin grafting well done consumes few minutes as a method it adds little if at all to the period of convalescence except so far as very early arm movements are concerned and nothing to the mortality I grant that to cut the grafts well much practice is necessary and the skill acquired by some is so great that I intrust this part of the procedure to the dexterous house surgeon Thiersch grafts from the thigh are commonly cut as large as a good sized hand One such graft may be sufficient to cover the defect more than two large grafts are not often required The silver foil dressing for the grafts used at the Johns Hopkins Hospital for so many years seems quite ideal

Occasionally and happily with increasing frequency an incision for diagnostic purposes has to be made Great care should be exercised to make these exploratory cuts no deeper than is absolutely essential Rarely is it necessary to carry the knife *into* a cancer for on exposure of the subcutaneous fat the tell tale drawing of the fibrous tissue is revealed sometimes the fat must be cut *into* for a little distance If the growth is not malignant the incision should usually pass through it

*Caustics* —I am indubitably convinced that the local and regionary recurrences after incomplete operations, which come as a rule with amazing rapidity when the knife has been used, are, to say the least, relatively late in making their appearance when chemical or actual cauterization has been employed. I have several times had occasion to operate upon cancers which had been vigorously and repeatedly treated with caustics, and to note the comparatively admirable condition, the freedom from cancer permeation, of the surrounding tissues and of the axilla, whereas, after incomplete operations with the knife the local manifestations of recurrence were almost invariably deplorable and the prognosis, of course, invariably hopeless.

It was my practice at one time in making the exploration in doubtful cases to excise a portion of the breast tumor with the Paquelin cautery to prevent the wound-inoculation which I feared might take place if the knife were used. The excision of a specimen for macroscopic or microscopic examination is never resorted to except just before operation. If the actual cautery for any reason is not used, the wound is immediately cauterized with carbolic acid. All incomplete operations for cancer should, when feasible, be made with the Paquelin or actual cautery.<sup>4</sup> The Paquelin is ideal for the removal of cutaneous nævi, particularly of the melanotic variety. I doubt if any melanotic tumor of the skin should be removed with the knife.

*Cancerous Axillary Glands with Non-demonstrable Cancers of the Mamma* —I have twice seen extensive carcinomatous involvement of the axilla due to mammary cancer which, latter, in neither instance became demonstrable for a considerable period after the axillary glands had attained conspicuous dimensions. In each case the "axillary tumors" had been removed, in one of them a year before and in the other per-

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<sup>4</sup>I was greatly pleased to note, during a recent visit to Rochester, Minnesota, that Drs. William and Charles Mayo make extensive use of the actual cautery in operations upon cancers incurable by the knife, and to have them indorse the view, so long maintained by me, that there is relative immunity from local metastasis with the employment of the cautery.

haps two years prior to my first examination which though made in the most careful manner failed to find the slightest evidence of cancer of either breast. In the course of a few months thereafter the mammary disease manifested itself in both patients.

A third patient was operated upon for enlarged glands of the axilla about two and a half years before she consulted me concerning the local axillary recurrence of the disease and more especially to be relieved of severe neuralgic pains in the arms and legs. In this woman I found a large mass of axillary glands which proved later to be cancerous but nothing in the breast except a quite indefinite parchment like induration at the base of the nipple which was retracted not at all or merely to a barely appreciable degree. With performance of the complete breast operation the pains in the extremities which distressed her greatly vanished.

*Disseminated Pains Which Would Seem to be Caused Occasionally by the Toxines Generated in the Course of the Growth of Cancer*—Distressing pains in the knees the legs the back the arms so severe and so located as to suggest cancerous involvement of the vertebræ have in two cases operated upon by me at the Johns Hopkins Hospital disappeared on removal of the growth which in one instance was large ulcerous and foul smelling in the other (the case cited at the end of the preceding paragraph) consisted merely of a large mass of glands in the axilla.

*Reactionary Œdema in Mammary Cancer*—Quite recently I was privileged to see a condition of board like œdema limited in a general way to the pectoral region of one side. There was no definitely appreciable abnormality of the mamma other than the œdema in the area of which it was included and not until perhaps six months after the first manifestation of this œdema was there the least evidence of neoplastic disease of the breast. Then as in my experience is usually the case in the presence of excessive œdema of reaction the cancer made very rapid strides.

END RESULTS OF 376 PRIMARY OPERATIONS FOR  
CARCINOMA OF THE BREAST AT THE MASSA-  
CHUSETTS GENERAL HOSPITAL, BETWEEN  
JAN 1, 1894, AND JAN 1, 1904

BY ROBERT B GREENOUGH, M D , CHANNING C  
SIMMONS, M D , J DELLINGER BARNEY, M D ,  
OF BOSTON, MASS

At the request of Dr Leconte, and of Dr Warren, we have determined the results of operations for breast cancer, at the Massachusetts General Hospital, for the ten years prior to January 1, 1904

This investigation was undertaken with the assent and approval of the members of the hospital staff, and with the assistance of the administrative officers of the hospital, 376 cases, or over 90 per cent of the total of 416 primary operations performed during the ten years, have been followed to a definite end result

As the returns came in the results were assembled in five classes, viz (1) Alive and well, (2) Alive with recurrence, (3) Died of operation, (4) Died without recurrence over three years after operation, (5) Died with recurrence, and from the proportion of these results the percentages were calculated. Cases dying of other diseases within three years of operation were either thrown out entirely or classed as failures, there were 28 cases of doubtful recurrence, these were cases of apoplexy, meningitis, pneumonia, gastro-enteritis and other diseases which, occurring after operation for breast cancer, raise strong suspicion of internal metastasis. It is probable that a certain number of these cases were actually free from recurrence, but to err on the side of safety they have been classed as failures

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\* Author's abstract Read by invitation before the American Surgical Association, Washington, May 8, 1907

Of the 376 traced cases of primary operation 64 are now alive and well at periods of from three to thirteen years after leaving the hospital. The relative freedom from disability of this group of cases is very gratifying. Almost every patient had good or perfect use of the arm on the affected side and only one complained of a stiff shoulder and that a case in which the wound went badly septic.

In about one third of the cases mention is made of a certain amount of swelling of the arm and less frequently of the hand. It is encouraging to feel that this swelling is not invariably a sign of return of the disease.

There were 7 cases included in the group of those dying over three years after operation without evidence of recurrence: 2 died of debility and old age, 2 died of consumption, 1 died of apoplexy six years after operation after recovering from a previous apoplexy three years before, 1 died of acute renal disease and 1 died in the hospital of pneumonia with an autopsy to confirm the absence of recurrence.

These two groups, 64 cases alive and well and 7 dead without recurrence over three years after operation, form the 71 successful cases.

The *operative mortality* of the whole series of 416 cases was 15 or 3.6 per cent. The causes of death were: Pneumonia 6, pulmonary embolism 2, hæmorrhage and shock 4, sepsis 3.

The operative mortality was highest after palliative operations.

Following the method adopted by Dr. Halsted we have arranged this report under the following headings: (1) Extent of Involvement, (2) Variety of Cancer, (3) Duration of Disease, (4) Magnitude of Operation.

The *Extent of Involvement* we have found somewhat difficult of determination but we have attempted to express it under the following conditions:

1. *Adherence of the tumor to the skin*. This was present in 262 cases with 16 per cent. successful operations and absent in 71 cases with 32 per cent. of freedom from recurrence.



The chances of relief appear to be twice as good as when the skin is not adherent to the tumor

2 *Adherence to chest wall* occurred in 45 cases with 11 per cent successful results No adherence was detected in 194 cases, with 21 per cent free from recurrence Again the chances of recovery appear to be nearly twice as great when the tumor is not adherent to the chest wall

3 *Enlarged glands in the axilla* were felt before operation in 236 cases with 12 per cent freedom from recurrence No glands were felt in 117 cases with 29 per cent successful results This suggests that absence of palpable enlargement of the axillary glands is a favorable indication, in spite of the fact that the glands removed as a routine measure are almost invariably found to be malignant

4 *Palpable enlargement of the glands above the clavicle* occurred in 40 cases, of which only 2 survive, and those were cases in which the enlarged glands were removed and found not to be cancerous on microscopic examination No case recovered in which palpably enlarged cancerous glands were detected in the neck

5 *Involvement of both breasts*, which occurred in 6 cases, was invariably fatal

6 *Ulceration of the tumor* is also of bad prognostic import Of 60 cases, in which the tumor had progressed to ulceration, 66 per cent recoveries took place, while of 316 cases in which no ulceration was present, 21 per cent were free from later recurrence

*The varying degrees of malignancy* of the different varieties of cancer of the breast has received attention from many writers Of our total of 376 cases analyzed, in all but 39 the report of a pathologist upon the tumor was available It is probable that nearly all of the tumors were examined, but some of the reports could not be obtained from the records One hundred and twenty-seven reports gave "cancer" only as the diagnosis, without specifying the variety

The percentage of successful cases for the different varieties of carcinoma was as follows 1 Medullary carci-

noma 16 per cent    2 Scirrhus carcinoma 23 per cent  
 3 Adenocarcinoma 47.6 per cent    4 Colloid 66 per cent  
 5 Paget's Disease 12½ per cent    6 Cancer in the lactating  
 breast 28 per cent

The numbers of cases of Colloid Paget's and Lactation Cancer are too small to permit of very positive conclusions although the supposed low degree of malignancy of colloid cancer is substantiated. The difference between medullary scirrhus and adenocarcinoma however is striking and in accord with previous observations. Medullary cancer is the most malignant and adenocarcinoma is relatively benign. The malignancy of scirrhus cases in this series is perhaps greater than has been estimated by other writers; it is much more grave than adenocarcinoma though not so serious as medullary.

*Duration of the Disease*—The study of the duration yielded no conclusive results. In the individual case there is no question but that the duration is of the greatest significance but when taken in connection with other more significant factors such as the extent of involvement and the variety of cancer the effects of duration seem to be obscured. Freedom from recurrence was obtained equally in cases of long and those of short duration.

*The operations* performed upon these cases were divided into four groups—Complete Semi-Complete Incomplete and Palliative.

1 *Complete operations* were performed on 160 cases in this group are included all operations in which the whole breast axillary contents and sternal portion of the pectoralis major were removed and the pectoralis minor either divided or removed. This statement of the requisites of a complete operation was accepted as the opinion of a majority of the surgeons at the hospital. Of the 160 complete operations 16 per cent were successful in preventing recurrence of the disease. In 26 of the 160 cases the neck was dissected and lymphatic glands removed but in only one case in which the glands removed were found to be infected was the operation a success in preventing recurrence.

The amount of skin removed with the breast has seemed to us a matter of great importance. In 67 of the complete operations, so much skin was taken that a plastic operation or skin-graft was necessary to close in the defect. The end results of these cases (19.4 per cent free from recurrence) were better than of those in which the skin edges were readily drawn together (11.7 free from recurrence), but showed most conspicuously in the matter of recurrence in the scar, 57.6 per cent of the plastic operations remained free from local recurrence in the scar, while only 44 per cent of the sutured wounds were thus successful.

2 *Semi-complete operations* were performed in 75 instances. These were exactly similar to the complete operation, with the exception that the pectoralis minor was not disturbed, 25.3 per cent remained free from recurrence.

3 *Incomplete Operations*—Eighty-five cases, most of which were operated upon in the earlier years of this period, did not fulfill the conditions of the modern operation. In most of these the pectoralis major was not removed. In other cases part of the breast, or part of the axillary contents, were left behind. The results, however, were astonishing,—22 cases, or 25.9 per cent, remained free from recurrence.

These figures are, at first sight, a little disconcerting, but on consideration we have decided that the apparent paradox of more successful cases with the less extensive operations, is due to the selection of cases suitable for operation. Before the days of the complete operation, only the most favorable cases were considered suitable for an attempt at radical cure. As the complete operation developed, more and more advanced cases were submitted to operation, in the hope that they, too, might be saved. There are a number of surgeons in the hospital who perform a complete operation in practically every case, in order to give the patient the benefit of every possible chance of cure. Other surgeons reserve the more extensive operations for the earlier and more favorable cases. Lazarus, Barlow and Campiche, at the Middlesex Hospital, and Meissl, in the Vienna Clinic, have come in contact with the same

apparent paradox and arrive at the same conclusion in explanation

The advantage obtained by removal of the pectoralis minor appears to consist in the greater ease with which the upper axilla can be dissected. It is not apparent that this muscle is especially liable to infiltration

4 *Palliative operations* without hope of cure were performed in only 56 (or about 15 per cent of all the cases which came to operation). In all these cases cancerous tissue was supposed to have been left in the wound. Four cases however remained free from recurrence of the disease. It is possible that more of the disease was taken out in these cases than was supposed. It is not impossible however that a certain dosage of cancer may be recovered from spontaneously in human beings just as undoubtedly occurs in the study of experimental cancer in mice. The operative mortality of 4 cases or 7 per cent is higher after palliative operations than after the most complete and extensive dissections (4 per cent) but this is undoubtedly due to the enfeebled condition of patients with advanced cancer. At this point it may be reasonable to call attention to the fact that the cases we are reporting have not been selected in any way but are given as they are recorded consecutively in the hospital records. Thus 85 per cent of our cases have been subjected to an attempt at a radical cure whereas the number of cases really entitled to expectation of benefit from a radical operation was probably much less. We would suggest that statistics of end results could be judged more fairly if the number of cases rejected as unfit for radical operation during the same period were also published

*Recurrences* —The data obtained from the study of recurrences form one of the most interesting features of cancer statistics

There were 126 cases in which it is known that local recurrence appeared in the scar and 138 in which it is known that none occurred. Thus 52 per cent or over one-half of the cases were free of local recurrence and would have been cured

if internal metastasis had not been already present, or did not, as seems possible in certain instances, result from the manipulation of the operation

The date at which recurrence first appeared could be established with certainty in only a few of the cases in this series. The duration of life, however, gives some light upon this point,—41 of the total of 290 cases of recurrence lived over three years after operation, and 13 of these cases never showed at any time a recurrence in the scar. It is clear that the statement that a case survived three years after operation, without evidence of local recurrence, does not preclude the possibility of such a case dying later of internal metastasis.

Four authentic cases of "*late recurrence*" occurred in this series of cases. Two had local recurrence in the scar, which did not appear until eight years and eight years and five months, respectively, after operation. One was free from all sign of recurrence for seven years, and then developed metastasis in the spine, and another, well for six years and nine months, developed evidence of recurrence in the abdomen. Adding these 4 to the 13 of the preceding paragraph, we have 17 cases which did not show any sign of recurrence at three years, but died later with recurrence. To express this otherwise, 88 cases passed the three-year period without recurrence, but of these 17 (19 per cent) later showed metastasis—exactly the percentage found by Schroder from a study of the cases at the Rostock Clinic.

### SUMMARY

I Out of 416 cases of primary operations for cancer of the breast at the Massachusetts General Hospital from 1894, 1903 inclusive, 376 were traced to a conclusive end result at an average period of eight years after operation.

II Sixty-four cases were alive and well and 7 died without recurrence over three years after the operation.

III Counting in the operative mortality, there were 320 attempts at radical cure, 67 of which, or 20.9 per cent, were successful.

IV During this same period palliative operations were performed on 56 patients (15 per cent ) and 52 cases were discharged untreated

V Cases in which the tumor was ulcerated or was adherent to the skin or to the chest wall and cases in which the axillary glands were palpably enlarged gave notably less promising results than when these conditions did not exist

VI No case with palpably enlarged cancerous glands above the clavicle and no case of cancer of both breasts was cured

VII Medullary carcinoma was more grave than that of the scirrhous type and adenocarcinoma and colloid were relatively of a far less malignant type

VIII The duration of the disease other than in the individual case exerted little influence on prognosis

IX Extensive operations with wide removal of skin gave the greatest freedom from local recurrence Removal of the pectoralis minor appeared to be of slight significance Incomplete operations on early cases yielded better results than extensive operations on cases which were well advanced

X Recurrence in the scar occurred in less than one half of the cases Internal metastasis was most frequent in the lungs mediastinum in the axillary and supraclavicular glands the liver and the spine

XI Seventeen out of 88 cases or 19 per cent of those passing the three year limit without evidence of recurrence showed recurrence later and 4 cases developed recurrence six years or more after the operation

# FINAL RESULTS IN 164 CASES OF CARCINOMA OF THE BREAST OPERATED UPON DURING THE PAST FOURTEEN YEARS AT THE AUGUSTANA HOSPITAL †

BY ALBERT J OCHSNER, M D,

OF CHICAGO,

Surgeon in Chief to the Augustana and St Mary's Hospitals

IN order to condense the study of these cases sufficiently to prevent this report from becoming altogether unwieldy it has seemed best to make the following tabulations, which were compiled by my associate, Dr N M Percy, from the case histories of the hospital

The present condition of 98 patients was determined partly by correspondence with patients and with their physicians, and partly by personal examinations

From 63 cases no information has been obtained as yet, but only 20 letters have been returned unopened, consequently it is fair to suppose that further information can be obtained concerning the condition of some of the 63 cases not heard from

Of the 98 cases concerning which we have received reports, 54 cases are still living, and all of these with two exceptions are at the present time free from recurrence

One patient, case No 38, had a carcinoma of both breasts, which were removed by primary operation in 1895 elsewhere In 1897 she had a recurrence in the left axilla, which I operated on December 7, 1897 This side has remained well since In 1899 she had a recurrence in the right axilla, which was removed elsewhere, and which has just developed a second recurrence

A second case, No 45, operated on September 19, 1898, for carcinoma of the breast, remained well until six months ago, when she noticed a swelling the size of a walnut, which has not been definitely diagnosed, although it is likely that it is a recurrence

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\* Read before the American Surgical Association, May, 8, 1907

I have not personally examined this patient since she left the hospital

The following table gives the number of living cases from which we have definite reports

|                                         |          |                 |
|-----------------------------------------|----------|-----------------|
| D i f f e r e n t m e t h o d s p r a t | 1 y      | 9 cases         |
|                                         | years    | 11 cases        |
|                                         | 3 y rs   | 5 cas           |
|                                         | 4 year   | 7 cases         |
|                                         | 5 years  | 4 cases         |
|                                         | 6 y ars  | 5 cases         |
|                                         | 7 years  | 4 cas           |
|                                         | 8 years  | 1               |
|                                         | 9 y rs   | 3 cases         |
|                                         | 10 y rs  | 1 case          |
|                                         | 11 years | 2 cas           |
|                                         | 12 y rs  | 0 cases         |
|                                         | 13 years | 2 cases         |
| T t l                                   |          | <u>54 cases</u> |

Of the 54 cases heard from ten complain of swelling or stiffness of the arm

An interesting fact observed in our series of cases is shown by the following table of deaths

It was found that but few of the very advanced cases which were considered quite hopeless at the time of operation lived more than one year after the operation making the number that died directly after the operation from shock together with those that lived less than one year 25 or about 15 per cent

## DEATHS

|                              |                 |
|------------------------------|-----------------|
| D i e d f r o m s h o c k    | 5 ases          |
| D i e d w i t h i n 1 y      | 9 cases         |
| D i e d w i t h i n 2 years  | 6 cases         |
| D i e d w i t h i n 3 y rs   | 6 ca            |
| D i e d w i t h i n 4 y ars  | 1 as            |
| D i e d w i t h i n 5 y ars  | 2 case          |
| D i e d w i t h i n 6 y rs   | 1 as            |
| D i e d w i t h i n 7 yea    | 1 case          |
| D i e d w i t h i n 8 yea    | 0 cas           |
| D i e d w i t h i n 9 y ars  | 0 cases         |
| D i e d w i t h i n 10 years | 0 ases          |
| D i e d w i t h i n 11 y     | 1 cas           |
| D i e d w i t h i n 12 y ars | cas             |
| D i e d w i t h i n 13 y ars | cases           |
| D i e d w i t h i n 4 y      | 1 case          |
| T t a l                      | <u>43 cases</u> |



ANALYTICAL TABLE OF CASES OF CARCINOMA OF BREAST OPERATED UPON AT THE  
AUGUSTANA HOSPITAL

| Number | Hospital No | Age | Involvement of |        |      |        | Date of operation | Operation                                                | Date of last communication of patient | Result                                                                                 |
|--------|-------------|-----|----------------|--------|------|--------|-------------------|----------------------------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------|
|        |             |     | Ax Gl          | Cer Gl | Skin | Muscle |                   |                                                          |                                       |                                                                                        |
| 1      | 265         | 45  | X              |        |      |        | April 26, 1887    | Excision of breast and axillary glands                   |                                       | Died 10 months later                                                                   |
| 2      | 350         | 49  |                |        |      |        | Jan 12, 1888      | Excision of breast                                       |                                       |                                                                                        |
| 3      | 711         | 40  | X              |        |      |        | April 19, 1891    | Excision of breast and axillary glands                   | None                                  | Recurrence in 3 months Died 6 months later                                             |
| 4      | 714         | 62  | X              |        |      |        | May 8, 1891       | Excision of breast and axillary glands                   | None                                  |                                                                                        |
| 5      | 787         | 56  |                |        |      |        | Oct 4, 1891       | Excision of breast                                       | None                                  | Died 6 weeks later of carcinoma of liver, pancreas, and kidneys                        |
| 6      | 799         | 44  |                |        |      |        | Nov 3, 1891       | Excision of breast                                       | None                                  |                                                                                        |
| 7      | 961         | 50  | X              |        |      |        | Sept 18, 1892     | Excision of breast and axillary glands                   | None                                  | Had recurrence 1 year later Doctor applied paste causing necrosis Perfectly well since |
| 8      | 1069        | 45  | X              |        |      |        | March 28, 1893    | Excision of breast and axillary glands                   | None                                  |                                                                                        |
| 9      | 1224        | 61  | X              |        |      |        | Oct 24, 1893      | Excision of breast and axillary glands                   | None                                  | Had rapid recurrence                                                                   |
| 10     | 1293        | 47  | X              | X      | X    |        | Jan 2, 1894       | Excision of breast, axillary glands, and cervical glands | None                                  |                                                                                        |
| 11     | 1319        | 39  |                |        |      |        | Jan 30, 1894      | Excision of breast                                       | None                                  | No trouble since first illness                                                         |
| 12     | 1373        | 44  |                |        |      |        | March 12, 1894    | Excision of breast                                       | April 16, 1907                        |                                                                                        |
| 13     | 1673        | 36  | X              |        |      | X      | Oct 19, 1894      | Excision of breast and axillary glands                   | April 24, 1907                        | Had rapid recurrence                                                                   |
| 14     | 1850        | 31  | X              |        |      | X      | Dec 26, 1894      | Excision of breast and axillary glands                   | None                                  |                                                                                        |
| 15     | 1970        | 82  |                |        |      |        | Feb 14, 1895      | Excision of breast                                       | None                                  | No trouble since first illness                                                         |
| 16     | 2133        | 63  |                |        |      |        | June 2, 1895      | Excision of breast                                       | None                                  |                                                                                        |
| 17     | 2187        | 45  | X              |        |      |        | July 1, 1895      | Excision of breast and axillary glands                   | None                                  |                                                                                        |



ANALYTICAL TABLE OF CASES OF CARCINOMA OF BREAST OPERATED UPON AT THE  
AUGUSTANA HOSPITAL — *Continued*

| Number | Hospital No | Age | Involvement of |        |      |        | Date of operation | Operation                                                        | Date of last communication of patient | Result                                                                                                                                                                                                            |
|--------|-------------|-----|----------------|--------|------|--------|-------------------|------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |             |     | Ax Gl          | Cer Gl | Skin | Muscle |                   |                                                                  |                                       |                                                                                                                                                                                                                   |
| 39     | 4783        | 48  | ×              |        |      |        | March 29, 1898    | Excision of breast and both pectoral muscles and axillary glands | None                                  |                                                                                                                                                                                                                   |
| 40     | 4999        | 39  |                |        |      |        | May 3, 1898       | Excision of breast                                               | None                                  |                                                                                                                                                                                                                   |
| 41     | 5035        | 38  | ×              |        |      |        | May 22, 1898      | Excision of breast and axillary glands                           | April 19, 1907                        | No recurrence Never felt better than she does now                                                                                                                                                                 |
| 42     | 5156        | 58  | ×              |        |      |        | July 12, 1898     | Excision of breast and axillary glands                           | April 15 1907                         | No recurrence in 7 years, when she died of some other trouble                                                                                                                                                     |
| 43     | 5281        | 48  | ×              |        |      |        | Aug 21 1898       | Excision of breast and axillary glands                           | None                                  |                                                                                                                                                                                                                   |
| 44     | 5362        | 44  | ×              |        |      |        | Sept 11 1898      | Excision of breast and axillary glands                           | Examined April 8 1907                 | No signs of recurrence General health good                                                                                                                                                                        |
| 45     | 5397        | 45  | ×              |        |      |        | Sept 19, 1898     | Excision of breast and axillary glands                           | April 18, 1907                        | Felt poorly for 4 years after operation Since then very well stiffness of arm from shoulder to elbow 6 months ago noticed swelling size of walnut Did not state location Died of cancer two years after operation |
| 46     | 5416        | 55  | ×              |        |      |        | Sept 27, 1898     | Excision of breast and axillary glands                           |                                       |                                                                                                                                                                                                                   |
| 47     | 5460        | 50  | ×              |        |      |        | Oct 5, 1898       | Excision of breast and axillary glands                           | None                                  |                                                                                                                                                                                                                   |
| 48     | 5484        | 50  | ×              |        |      |        | Oct 15, 1898      | Excision of breast and axillary glands                           | None                                  |                                                                                                                                                                                                                   |
| 49     | 5525        | 53  | ×              |        |      |        | Oct 27, 1898      | Excision of breast and axillary glands and pectoral muscles      | None                                  |                                                                                                                                                                                                                   |
| 50     | 5541        | 34  | ×              |        |      |        | Nov 1, 1898       | Excision of breast and axillary glands and pectoral muscles      | None                                  |                                                                                                                                                                                                                   |
| 51     | 5637        | 44  | ×              |        |      |        | Dec 6, 1898       | Excision of breast and axillary glands and pectoral muscles      | None                                  |                                                                                                                                                                                                                   |
| 52     | 5684        | 42  |                | ×      |      |        | Dec 27, 1898      | Excision of breast                                               | None                                  |                                                                                                                                                                                                                   |
| 53     | 5822        | 41  | ×              | ×      | ×    |        | Feb 4, 1898       | Excision of breast and pectoral muscles and axil and cer glands  | None                                  | Died of shock on 4th day                                                                                                                                                                                          |



ANALYTICAL TABLE OF CASES OF CARCINOMA OF BREAST OPERATED UPON AT THE  
AUGUSTANA HOSPITAL—Continued

| Number | Hospital<br>No | Age | Involvement of |    |     |      | Date of<br>operation | Operation                                                   | Date of last<br>communication<br>of patient | Result                                                                                                                   |
|--------|----------------|-----|----------------|----|-----|------|----------------------|-------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|        |                |     | Ax             | Cl | Cer | Skin | Muscle               |                                                             |                                             |                                                                                                                          |
| 70     | 7528           | 31  | X              |    |     |      |                      | Excision of breast and pectoral muscles and axillary glands | None                                        | Died of shock on 4th day                                                                                                 |
| 71     | 7530           | 77  | X              |    |     |      | X                    | Excision of breast and pectoral muscles and axillary glands |                                             | Had rapid recurrence and died about 6 months after operation                                                             |
| 72     | 7534           | 37  | X              |    |     |      | X                    | Excision of breast and pectoral muscles and axillary glands |                                             |                                                                                                                          |
| 73     | 7717           | 40  | X              |    |     |      | X                    | Excision of breast and pectoral muscles and axillary glands | None                                        |                                                                                                                          |
| 74     | 7749           | 48  | X              |    |     |      | X                    | Excision of breast and pectoral muscles and axillary glands | None                                        | Died of shock next day                                                                                                   |
| 75     | 7968           | 66  | X              |    |     |      |                      | Excision of breast and pectoral muscles and axillary glands |                                             | Died of shock same night                                                                                                 |
| 76     | 8083           | 44  | X              |    |     |      |                      | Excision of breast and pectoral muscles and axillary glands | April 15 1907                               | Arm in good health Has not been bothered again                                                                           |
| 77     | 8103           | 61  | X              |    |     |      |                      | Excision of breast and pectoral muscles and axillary glands | None                                        |                                                                                                                          |
| 78     | 8123           | 38  | X              |    |     |      | X                    | Excision of large area skin Skin grafting                   |                                             | Recurrent case                                                                                                           |
| 79     | 8141           | 65  |                |    |     |      | X                    | Excision of nodule in scar                                  |                                             | Primary operation 18 months previous Recurrent nodule in scar Lived 3 years after this 4½ years after previous operation |
| 80     | 8154           | 50  |                |    |     |      |                      | Excision of breast and pectoral muscles and axillary glands | None                                        |                                                                                                                          |
| 81     | 8350           | 37  | X              |    |     |      |                      | Excision of breast and pectoral muscles and axillary glands | April 16, 1907                              | No recurrence to present time operation successful No X ray                                                              |

|    |      |    |   |  |          |   |             |       |         |             |           |                 |
|----|------|----|---|--|----------|---|-------------|-------|---------|-------------|-----------|-----------------|
| 8  | 8575 | 35 | X |  | J 9 9    | d | April 9 907 | N     | rm f d  | P f ly w ll | p l       |                 |
| 83 | 8648 | 57 | X |  | J 3 90   | d | Ap 1 20 9 7 | P r f | ly w ll | p           | ly f l rm |                 |
| 84 | 874  | 43 | X |  | F b 5 90 | d | Ap 1 8 907  | E ml  | d p     | ly N g f    | rr        | N oad m f m     |
| 85 | 8838 | 39 |   |  | M h 6 90 | d | N           |       |         |             |           |                 |
| 86 | 9038 | 46 | X |  | Ap 1 8 9 | d | Ap 1 6 9 7  | N     | rm f d  | H i         | p l       | d               |
| 87 | 9 47 | 29 |   |  | M y 7 9  | d | f ly w ll   | Tw    | rs l    | hl g i      | d         | radl dl m f r t |
| 88 | 9    | 56 | X |  | J 3 9    | d |             | Gr    | All d   | pp d        | d         | ly f            |
| 89 | 933  | 76 | X |  | J 6 90   | d | N           | H d   | rr      | i           | ll ry g l | d f p po        |
| 90 | 9538 | 3  | X |  | A g 3 90 | d | N           | 6m    | h l     |             | ld i      | m h D d         |
| 9  | 934  | 38 | X |  | A g 3 9  | d | N           |       |         |             |           |                 |
| 9  | 9753 | 34 | X |  | O 90     | d |             |       |         |             |           |                 |
| 93 | 9793 | 67 | X |  | O 5 9    | d |             |       |         |             |           |                 |
| 94 | 9800 | 4  | X |  | O 7 9    | d | and         |       |         |             |           |                 |
| 95 | 984  | 70 | X |  | O 9 90   | d | N           |       |         |             |           |                 |
| 96 | 9904 | 60 | X |  | O t 3 90 | d |             |       |         |             |           |                 |
| 97 | 995  | 4  | X |  | N 5 90   | d |             |       |         |             |           |                 |

ANALYTICAL TABLE OF CASES OF CARCINOMA OF BREAST OPERATED UPON AT THE AUGUSTANA HOSPITAL — *Continued*

| Number | Hospital No | Age | Involvement of |       |      |        | Date of operation | Operation                                                                               | Date of last communication of patient | Result                                                                                                          |
|--------|-------------|-----|----------------|-------|------|--------|-------------------|-----------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|        |             |     | Ax G           | Cer G | Skin | Muscle |                   |                                                                                         |                                       |                                                                                                                 |
| 98     | 10167       | 60  | X              |       | X    |        | Jan 10, 1902      | Excision of breast and pectoral muscles and axillary glands. Skin graft                 |                                       | Had rapid recurrence and died 4 months later                                                                    |
| 99     | 9985        | 32  | X              |       |      |        | Nov 18, 1902      | Excision of breast and pectoral muscles and axillary glands                             |                                       | Died of recurrence 2 years later Had many X ray treatments                                                      |
| 100    | 10360       | 48  | X              |       | X    |        | Feb 28 1902       | Excision of breast and pectoral muscles and axillary glands                             | April 12, 1907                        | Perfectly well Took X ray treatment for 1 year                                                                  |
| 101    | 10441       | 67  | X              |       |      |        | March 10, 1902    | Excision of breast and pectoral muscles and axillary glands                             | None                                  |                                                                                                                 |
| 102    | 10656       | 67  | X              | X     | X    |        | June 23, 1902     | Excision of breast and pectoral muscles and axillary glands. Inoperable. No improvement |                                       |                                                                                                                 |
| 103    | 10933       | 66  | X              | X     | X    |        | June 23 1902      | Excised recurrent mass in skin and axillary and cervical glands                         |                                       | Primary operation 6 years previous Not heard from since second operation                                        |
| 104    | 11064       | 52  | X              |       |      |        | July 21, 1902     | Excised breast and pectoral muscles and axillary glands                                 |                                       | Had other breast excised for carcinoma 2 years previous X ray for 1 year after first operation                  |
| 105    | 11437       | 64  |                |       |      |        | Sept 29, 1902     | Excised breast and pectoral muscles and axillary glands                                 |                                       | Died of recurrence in May 1903                                                                                  |
| 106    | 11658       | 54  | X              |       |      |        | Nov 22, 1902      | Excised both breasts for carcinoma                                                      |                                       | Died of cancer of stomach 1 year later                                                                          |
| 107    | 11790       | 41  |                |       |      |        | Dec 8, 1902       | Excised breast and pectoral muscles and axillary glands                                 | April 15, 1907                        | Took 60 X ray treatments after operation No recurrence Great deal of pain in shoulder                           |
| 108    | 12015       | 33  | X              |       |      |        | Jan 21, 1903      | Excised breast and pectoral muscles and axillary glands                                 |                                       | 18 months after operation had recurrence in ilium, from which she died Had X ray for 1 year following operation |
| 109    | 12098       | 57  | X              |       |      |        | Feb 6, 1903       | Excised breast and pectoral muscles and axillary glands                                 | April 13, 1907                        | No recurrence Great deal of oedema of arm X ray for 1 year                                                      |

|      |      |   |   |   |             |         |                                             |            |                         |                              |                           |                 |     |
|------|------|---|---|---|-------------|---------|---------------------------------------------|------------|-------------------------|------------------------------|---------------------------|-----------------|-----|
| 30   | 44   | X | X | X | F b 3 903   | l<br>d  | dp<br>d                                     | F b 6 907  | N                       | r                            | G                         | d l f e d m     | arm |
| 4    | 4    | X | X | X | F b 5 93    | t<br>d  | dp<br>d                                     |            |                         |                              |                           |                 |     |
| 384  | 5    | X | X | X | Ap 1 903    | d       | dp<br>d                                     |            | D d f                   | r                            | f w m                     | b f p           |     |
| 3    | 43   | X | X | X | Ap 1 93     | sc<br>d | dp<br>d                                     | N          | 906                     | g f r                        | C                         | d b l e d m f m |     |
| 4    | 44   | X | X | X | Ap 1 93     | sc<br>d | dpe<br>d                                    |            |                         |                              |                           |                 |     |
| 5    | 69   | X | X | X | Ap 1 7 903  | d       | dp<br>d                                     |            | D d 3                   | f p                          | N l l g f                 |                 |     |
| 6    | 74   | X | X | X | J 8 903     | d       | dp<br>d                                     |            | D d 33                  | l f m p m                    | N l g n f r               |                 |     |
| 7    | 866  |   |   |   | J 30 903    | d       | dp<br>d                                     | N          |                         |                              |                           |                 |     |
| 8    | 982  | X | X | X | J ly 4 93   | d       | dpe<br>d                                    | N          |                         |                              |                           |                 |     |
| 9    | 37   | X | X | X | J ly 30 903 | d       | dp<br>d                                     |            | D d f                   | i h                          | 6 m b l                   |                 |     |
| 39   | 43   | X | X | X | J ly 3 903  | d       | dpe<br>d                                    | Ap 1 97    | P f ly                  | l l                          | pe                        |                 |     |
| 354  | 4    | X | X | X | A g u 6 903 | sc<br>d | dp<br>d                                     | M y 907    | P r f ly w l l          | H d f w X y m                |                           |                 |     |
| 3306 | 7    | X | X | X | O 9 903     | d       | dp<br>d                                     | Ap 1 907   | X y f                   | 3 m h O }<br>l h w m d       | W l l w                   | m d l p d i h   |     |
| 3    | 345  | X | X | X | O 903       | d       | dp<br>d                                     | Ap 1 3 907 | 30 X ray l<br>w l w l l | m f p t                      | S l g h w l l g f r m O h |                 |     |
| 4    | 343  |   |   |   | O 903       | d       | f b<br>p l l r y g l d<br>m l l o d l<br>ar | N          |                         |                              |                           |                 |     |
| 5    | 3905 | X | X | X | J 4 904     | X       |                                             | Ap 1 907   | R r r<br>l g h          | P m r y p r a J i<br>f d f b | 3 903<br>w h h w          | H d<br>r a l d  |     |



ANALYTICAL TABLE OF CASES OF CARCINOMA OF BREAST OPERATED UPON AT THE  
AUGUSTAN HOSPITAL — *Continued*

| Number | Hospital No | Age | Involvement of |       |      |        | Date of operation | Operation                                                           | Date of last communication of patient | Result                                                                                                                        |
|--------|-------------|-----|----------------|-------|------|--------|-------------------|---------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
|        |             |     | Ax G           | Cer G | Skin | Muscle |                   |                                                                     |                                       |                                                                                                                               |
| 126    | 13990       | 44  | X              |       |      |        | Feb 15, 1904      | Excised breast and pectoral muscles and axillary glands             | April 11, 1907                        | Died 18 months after operation of carcinoma                                                                                   |
| 127    | 14733       | 39  |                |       |      |        | July 18, 1904     | Excised breast and pectoral muscles and axillary glands             | None                                  | X ray for 3 months after operation Perfectly well now                                                                         |
| 128    | 14971       | 62  | X              |       | X    | X      | August 31, 1904   | Excised breast and pectoral muscles and axillary glands             | Jan, 1907                             | Recurrent case Had portion of breast removed 3 months previous Again had recurrence X ray and serum treatment Well at present |
| 129    | 15004       | 43  | X              |       |      |        | Sept 2, 1904      | Excised breast and pectoral muscles and axillary glands             | April 12, 1907                        | Perfectly well                                                                                                                |
| 130    | 15229       | 95  |                |       |      |        | Oct 22 1904       | Excised breast and pectoral muscles and axillary glands             | None                                  |                                                                                                                               |
| 131    | 15388       | 39  | X              |       |      |        | Nov 26, 1904      | Excised breast and pectoral muscles and axillary glands             |                                       |                                                                                                                               |
| 132    | 15398       | 35  | X              | X     | X    |        | Nov 30, 1904      | Excised breast and pectoral muscles and axillary glands             |                                       | Had rapid recurrence and died April 25, 1905                                                                                  |
| 133    | 15440       | 60  | X              |       | X    |        | Dec 7, 1904       | Excised breast and pectoral muscles and axillary glands             | April 10, 1907                        | No return of disease General health very good                                                                                 |
| 134    | 15533       | 70  |                |       |      |        | Jan 4, 1905       | Excised breast and pectoral muscles and axillary glands             | April 12, 1907                        | Examined personally No sign of recurrence                                                                                     |
| 135    | 15774       | 45  | X              |       | X    |        | Feb 22, 1905      | Excised breast and pectoral muscle and axillary glands Skin grafted |                                       | Died Oct 16, 1905 apparently from carcinoma inside of chest                                                                   |
| 136    | 15782       | 51  | X              |       |      |        | Feb 24, 1905      | Excised breast and pectoral muscles and axillary glands             | May 4, 1907                           | Perfectly well                                                                                                                |

|    |      |    |   |           |          |                |                                                                          |
|----|------|----|---|-----------|----------|----------------|--------------------------------------------------------------------------|
| 37 | 5 80 | 45 | X | Mc h 9 5  | dp<br>d  | Apil 8 907     | T k l g m g r e g h P r f l y w l l w                                    |
| 38 | 6 8  | 35 |   | My 9 5    | dpe<br>d | N              |                                                                          |
| 39 | 6 53 | 7  |   | My 4 9 5  | dp<br>d  | Apil 4 907     | Ab 3 m h f p m l l d l p p d b l<br>H k 7 X ray m N r r                  |
| 4  | 636  | 4  | X | J 5 905   | dp<br>d  | Apil 5 9 7     |                                                                          |
| 4  | 635  | 46 |   | J 5 9 5   | dp<br>d  | N              |                                                                          |
| 4  | 646  | 55 |   | J 3 905   | dp<br>d  | Apil 4 907     | N r r G l h l h h b g o d l n y                                          |
| 43 | 68 3 | 45 | X | Aug 3 905 | dp<br>d  | Apil 907       | N l g f r r                                                              |
| 44 | 68 4 | 39 | X | Aug 5 905 | dp<br>d  |                | D d d m h l f m c u m h                                                  |
| 5  | 7    | 46 | X | O 3 905   | dp<br>d  | Apil 5 907     | P f l y w l l p t m w l l g f m                                          |
| 46 | 7 47 | 57 | X | O 7 905   | dp<br>d  | N              |                                                                          |
| 47 | 74   | 45 | X | N 905     | dp<br>d  | Apil 907       | P r f l y w l l p l m h a a f f r m                                      |
| 48 | 75 5 | 54 | X | D 905     | dp<br>d  |                | H d p d r r d d d f l y 906                                              |
| 49 | 75 6 | 44 | X | D 8 9 5   | dp<br>d  | Apil 8 9 7     | S m m b r m O h w l l                                                    |
| 5  | 7558 | 38 |   | D 905     | dp<br>d  |                | D d b m h l f l m                                                        |
| 5  | 7606 | 5  |   | D 6 9 5   | dp<br>d  |                | R r r P l m r y p l j 905 D d f h k                                      |
| 5  | 7656 | 7  | X | J 3 9 5   | dp<br>d  | E m d Apil 907 | Th r y W d l d f l l r r Th l m d by<br>ry W d m p l y h l d S h l k X y |

ANALYTICAL TABLE OF CASES OF CARCINOMA OF BREAST OPERATED UPON AT THE  
AUGUSTANA HOSPITAL — *Continued*

| Number | Hospital<br>No | Age             | Involvement of |    |     |      | Date of<br>operation | Operation                                                                           | Date of last<br>communication<br>of patient | Result                                                                                                                                                                                        |                                         |
|--------|----------------|-----------------|----------------|----|-----|------|----------------------|-------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
|        |                |                 | Ax             | Cl | Cer | Skin | Muscle               |                                                                                     |                                             |                                                                                                                                                                                               |                                         |
| 153    | 17883          | 73              | X              |    |     |      |                      | Excised breast and dissected axilla                                                 | Examined April 3, 1907                      | Perfect result                                                                                                                                                                                | No signs of recurrence                  |
| 154    | 17907          | 48              | X              |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            |                                             |                                                                                                                                                                                               |                                         |
| 155    | 18694          | 52              | X              |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | April 22, 1907                              | No signs of recurrence                                                                                                                                                                        | Has pain in arm if she uses it too much |
| 156    | 18752          | 39              | X              |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | April 28, 1907                              | No return of former disease                                                                                                                                                                   | X ray 3 times a week for 5 weeks        |
| 157    | 18979          | 55              | X              |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | March 4, 1907                               | No recurrence                                                                                                                                                                                 | Some contraction of scar in axilla      |
| 158    | 18981          | 56              |                |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | April 30, 1907                              | Perfectly well                                                                                                                                                                                | Has had 24 X ray treatments             |
| 159    | 19033          | 49              | X              |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | April 18, 1907                              | No signs of recurrence                                                                                                                                                                        | Arm somewhat stiff                      |
| 160    | 19258          | 47              | X              |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | April 15, 1907                              | Perfect result                                                                                                                                                                                | X ray treatment for 4 months            |
| 161    | 19636          | 64              |                |    |     |      |                      | Excised breast and pec toral muscles and axillary glands                            | April 13, 1907                              | Took X ray treatment for 5 weeks                                                                                                                                                              | Feels perfectly well                    |
| 162    | 19799          | 65              | X              |    |     | X    | X                    | Excised breast and pec toral muscles and axillary glands and crur tenized over ribs |                                             | Died Feb 2, 1907, from extension of carcinoma into chest                                                                                                                                      |                                         |
| 163    | 19904          | 54              | X              |    |     | X    | X                    | Excised mass in old scar and crur tenized base of wound with actual cautery         |                                             | First operation Feb, 1900. Rapid recurrence. Second operation Oct 19, 1900. In 1901 another recurrence, which disappeared under X ray treatment. Present recurrence began 1 year ago.         |                                         |
| 164    |                | 48 <sup>9</sup> |                |    |     |      |                      | Excised breast                                                                      |                                             | Had recurrence 10 years later, which was excised May 23, 1899. Had recurrence 1 year later. Took X ray treatments until Oct, 1903, when she became bed fast and died a short time afterwards. |                                         |

Cases not heard from 63

Of the 44 patients whose deaths have been reported only 39 died either as a result of the operation or from recurrence

The following five cases died of other causes than carcinoma without recurrence

CASE 18—Age 47 died three years after operation from some acute disease not stated in the letter reporting her death No signs of recurrence

CASE 26—Age 57 died ten years and six months after operation from apoplexy No signs of recurrence

CASE 37—Age 59 died five years after operation from nephritis No signs of recurrence

CASE 42—Age 58 died seven years after operation No signs of recurrence

CASE 116—Age 54 died three years after operation from pneumonia No signs of recurrence

The following case seems to have especial interest

CASE 12—Age 44 was operated upon March 12 1894 One year later had recurrence in scar Doctor applied a paste causing necrosis of the wound This healed completely and patient has been perfectly well since Now thirteen years and two months since operation

It has seemed proper to use X ray treatment systematically in all cases after operation This however was not always possible in patients living in the smaller country towns

*Cases which had X ray Treatments*—All cases operated during the past six years had X ray exposures during the patient's stay in the hospital Of the cases heard from 22 took X ray treatment after leaving the hospital

The following cases seem to be sufficiently interesting to justify especial abstracts of their histories

CASE 87—Age 29 Operated May 17 1901 Six months later she had a recurrence in the line of the incision with numerous nodules in the skin a recurrence in the axillary and cervical glands and apparently a carcinoma in the cranial cavity causing a marked protrusion of the right eye All of these disappeared

under X-ray exposures The patient was last heard from one year ago She was perfectly well at this time, five years after the operation

CASE 96—Age 60 Had recurrence one year after operation This disappeared under X-ray exposures, but recurred two years later, from which she died

CASE 125—Age 50 Operated upon January 24, 1904 Following this had recurrence in scar Was given vigorous X-ray exposures with very little benefit Arsenic was applied to wound, causing necrosis of considerable amount of tissue Wound healed completely Patient perfectly well now

CASE 129—Age 43 Operated upon September 9, 1904 Had primary operation three months previous, when only a portion of the breast was removed Had second recurrence a few months later Under X-ray exposures and the treatment by hypodermic injections of a proprietary remedy recurrence disappeared and she is now perfectly well

CASE 163—Age 54 Primary operation February, 1900 Rapid recurrence Second operation October, 1900 A few months later a second recurrence, involving the axilla and the cervical lymph glands and the tissues of the scar, making further operative treatment apparently hopeless This disappeared under X-ray treatment and remained well for four years Third recurrence began one year ago This was excised December 10, 1906 Has had X-ray treatment most of the time during the past five years Examined May 20, 1907, and found well

CASE 164—Age 48 Operated upon May 23, 1889 Had recurrence ten years later, which was excised May 23, 1899 Recurred one year later Took X-ray treatments continually for three and one-half years, when she died of carcinoma

A review of this series of cases, although incomplete, seems to show that if the very complete operation which is now generally practised is employed in these cases reasonably early, there is much reason for expecting a fair percentage of permanent cures

# END RESULTS FOLLOWING OPERATIONS FOR CARCINOMA OF THE BREAST \*

BY NATHAN JACOBSON M D

OF SYRACUSE, NEW YORK

Prof of Surg in Syracuse Univ School of Med and St Joseph Hospital

IN discussing the results to be obtained from operation upon carcinoma of the breast there are various factors to be carefully weighed. Considering these in their natural order we should first be concerned with the period of duration of the disease and the rapidity of its progress next with the extent of involvement of the various structures and the character of the carcinoma and finally with the radical nature of the operation performed for its removal.

It is not always possible to determine the period of duration of the disease. Inasmuch as in its early stages carcinoma is entirely devoid of pain it is frequently a matter of accident that the tumor is discovered. In one of my cases the patient dreamed that she had a tumor of the breast and the next morning on awakening was startled to find on placing her hand upon the gland that a tumor was present.

The rapidity with which the disease progresses is of paramount importance. I think that it will be conceded without dispute that there is as much difference in the virulence of cases of carcinoma as there is in acute infectious fevers. In some instances of the latter the fever will progress so mildly as to scarcely disturb the patient while in other instances it will overwhelm the individual with such fury as to be fatal within twenty four hours. Acute cases can be of scirrhus as well as medullary character.

October 9 1901 a woman forty-one years of age the mother of two children both of whom she had nursed and never having

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Read at the meeting of the American Surgical Association May 8 1907

had any disturbance of the breasts because of lactation, presented herself for examination Ten days before she had discovered a hardness in the right mammary gland I found a tumor the size of a hen's egg in the right breast, occupying the outer upper quadrant, freely moveable and non-adherent In the axilla there were many glandular masses which were hard and somewhat fixed to the skin It did not seem possible that this condition could have been of but ten days' duration At the operation not only the skin covering the mammary gland but that of the axilla was freely removed as well as the axillary contents and both pectoral muscles The axillary mass was found to be larger than the primary growth She made a rather slow recovery inasmuch as it was impossible to cover the entire surface at the operation and some of the healing therefore was by granulation A recurrence in the axilla was discovered January 17, 1902 This was removed five days later by operation Union this time was by first intention February 7, 1902, that is a little more than two weeks after her second operation, she began to suffer from pains in the abdomen, chest and back Early in March twitching occurred in both lower extremities On March 11 there was complete paralysis of sensation and motion below the level of the seventh dorsal vertebra The patient died April 23, 1902, within six months of the first evidence of the disease Microscopic examination of the tumor showed it to be a scirrhus carcinoma

Another equally virulent scirrhus cancer occurred in a woman fifty-two years of age, operated upon November 18, 1899 She had known of the presence of the growth but two days and yet upon examination the entire gland was found to be implicated, the skin adherent, the nipple retracted, and the corresponding axillary glands palpable A very wide excision of all of the diseased area including the skin, mammary gland, pectoral muscles and the axillary contents was performed The patient made a rapid recovery, the wound healing by first intention She left the hospital on the sixteenth day after operation in good general condition Three months later there was not only recurrence in the scar at the junction of the middle and lower third but over the entire chest and on the back small shot-like nodules were to be felt as well as nodes in the supraclavicular spaces Similar nodules appeared in various parts of the body, rapidly increased

in size as well as number the cachexia grew profound and the patient succumbed to the disease in August 1900

In this class of cases it matters little what operation is selected or how early it may be performed the evident virulence of the infection renders a permanent cure impossible As far as I am aware there is nothing which either the surgeon or the pathologist can discover at the time of operation which will make it possible for him to determine the degree of malignancy of the affection aside from the rapid course the disease has pursued up to the time of operation

There is another class of cases which show their tenacity and the patient's susceptibility to carcinoma by repeated outbreaks in different parts of the body

On June 19 1895 I curetted the uterus of a woman forty years of age and found carcinomatous disease of the fundus Not until the next spring did she consent to hysterectomy In May 1898 she discovered a tumor in the depth of her right breast Amputation of the gland was not permitted until September 18 1898 The tumor about 1½ inches in diameter did not involve the skin and was quite moveable There were numerous glands to be felt in the axilla and after removal of the breast the pectoral muscles sub pectoral and axillary glands the patient apparently made a very good recovery Glandular metastases discovered in the posterior triangle of her neck on the right side and in the axilla in January 1900 were again removed On June 7 1900 there was a recurrent nodule in the scar tissue on the chest and this was cut out She remained well until January 1902 when there was another recurrence in the cicatrix and involvement of the supraclavicular glands of the opposite side of the neck In removing them I followed the chain down until I found it to be continuous with the glands in the mediastinum From this time on she suffered greatly from dyspnoea laryngeal stridor and a racking cough There was implication of the left recurrent laryngeal nerve In December 1902 orthopnea was marked She died January 9 1903 fully eight years after the first evidence of carcinomatous disease

On March 10 1897 I performed hysterectomy for carcinoma



of the uterus on a woman thirty-nine years of age, from which she made a very satisfactory recovery September 23, 1899, she presented herself to me with a hard tumor in the lower outer quadrant of the left breast associated with enlarged axillary glands. The entire breast with its overlying skin, the axillary glands and the pectoralis major were removed. She had no recurrence of the carcinomatous disease either in the breast or pelvis but developed cancer of the stomach from which she died January 2, 1901.

In still another case I amputated the right breast in March, 1891, and without evidence of any local recurrence she returned to me in June, 1892, with a similar disease of the left breast. This was likewise amputated. In January, 1895, a spinal metastasis occurred and the patient gradually became paralyzed in both upper and lower extremities and died of the spinal recurrence December 21, 1895.

This group of cases in which carcinoma manifests itself in different organs of the body and in which the new outbreak of the disease occurs without return at the primary site indicates that in a certain class of cases we cannot lose sight of the personal equation, as evidently some individuals possess a pronounced susceptibility to cancerous disease.

That advanced age is not a matter of great import in determining the prognosis is evident in the following two cases.

The first was a woman eighty years of age, who had known of the presence of the tumor for two weeks. Radical operation was performed on June 30, 1904. The axillary space was thoroughly cleared out, the pectoralis major was removed, and in just two weeks' time she left the hospital, primary union having followed operation. She died one year later of conditions incident to her vascular condition and without recurrence of the cancer. The pathologist's report in this case was scirrhus carcinoma.

In the second case I operated upon a woman seventy-eight years of age who had been aware of the presence of the tumor but ten days. Here also there was well advanced atheromatous degeneration. She did not die until five years after operation, when her death was caused by apoplexy. At the time of operation

the patient was already suffering from cerebral changes incident to the vascular disease. She complained of tingling and numbness of her extremities and suffered from dizziness and aphasia. Ten months after operation there was a slight recurrence in the scar. This was treated by the application of a caustic paste which removed the diseased part. In the course of six weeks it had entirely healed. The patient had no subsequent recurrence.

This is the only instance in which I did not use the knife for the removal of the recurrent growth.

On the contrary I embodied in a paper read before the Medical Society of the State of New York at its annual meeting in 1896 some statistics obtained from a gentleman whose wife was treated at a so called cancer cure institution by means of caustic applications. Among those receiving the same treatment in this institution were fifteen patients with carcinoma of the breast. The end result of the treatment was obtained in each case. In no instance was there any benefit but each and every one died of the cancerous affliction after months of torture.

I had occasion to operate upon a religious sister in May 1890 for carcinoma of the breast of one year's duration during which period she had been treated by a self styled cancer specialist with caustic plasters only to produce a sloughing condition of the breast. A prompt recovery followed removal of the breast the axillary contents and part of the pectoralis major. A letter received from her physician Dr Hancock of Jeffersonville Indiana April 22 1907 i.e. seventeen years later reports her to be in good health with no recurrence of cancer.

There can be no doubt that the removal of recurrent growths may be followed by lasting cures.

A patient was operated upon by me August 24 1896 for scirrhus of the right breast of some months existence. There were marked glandular metastases in the axilla. Local recurrence in the scar tissue and neighboring glands appeared twenty one months later. The recurrent growths were removed by

operation May 18, 1898, and since then the patient has had no return, has enjoyed perfect health, and has the full use of her arm

Whether sex is a factor to be considered in the ultimate prognosis of malignant diseases of the breast I am unable to say I have had but 3 cases of malignant tumor of the male breast, each of them recurring and in the end causing death

I have been greatly disappointed in my efforts to obtain information in regard to many of the patients upon whom I have operated Of 71 cases reported upon and which were operated more than three years ago, 35 are still living, 33 died of metastases and 3 within a year after operation of other diseases

As has been stated, some of the most acute recurrences have been in cases of the scirrhus type

In our pathologic studies some attention has been given to the investigations of the presence of mitotic figures to determine whether evidence of active cell division implied the probability of early recurrence This has not been found to be the case For example, in one specimen of scirrhous mitotic figures were found to be rare in the breast tumor, but numerous in the lymph nodes There was evidence of spinal metastases eight months after operation, death occurring two months later In another scirrhous carcinoma of a breast removed May 27, 1903, mitotic figures were very abundant, but the patient is at present in the full enjoyment of health, having never had the slightest recurrence

During the past ten years I have employed the incision suggested by Dr Halsted and have followed his technique except as to the removal of the supraclavicular glands in all cases The latter step has only been undertaken when there has been apparent invasion of the neck The axillary space has been thoroughly cleaned out, the pectoralis major and sometimes the pectoralis minor have been removed After making the skin incision, the axillary space is first cleared and an attempt made to remove everything en masse The great advantage of being able to see the field of operation clearly

at every step of the operation cannot be too highly appreciated

For the past two years when it has been possible to do so the patients have been given weekly X ray treatments for at least three months after their recovery from the operation

During the decade preceding the last ten years I was guided by the principles enunciated by the late Samuel W Gross in the paper presented to this association at its meeting in 1881. A circular incision was made around the breast and extended into the axilla. The axillary fat with the glands buried in its substance was removed together with the upper layer of the pectoralis major. In cleaning the axilla by this method one had to depend largely upon the sense of touch and hence there was always a degree of uncertainty as to whether all invaded structures were thoroughly removed. That this result was obtained in many instances however there can be no doubt

In 1890 I operated upon 3 religious sisters one in May another in June and still another in November. In only one of these cases has there been a recurrence. This was in March 1906 that is sixteen years after the operation when there appeared in the abdomen numerous nodules presumably involving the various abdominal viscera. They were hard and fixed. She died September 2 1906. No autopsy was permitted

This brings up the question of what we are to consider a cure. I think it must be conceded that the three year limit usually put upon these cases is altogether too short to determine the end result. While in most instances a patient remaining entirely well for three years is quite apt not to suffer from further recurrence the exceptions to this rule are by no means rare

A woman operated upon by me December 19 1888 when in her thirty seventh year of age and in whom a scirrhus carcinoma of the breast had been present for about a year showed no further signs of malignant disease until the spring of 1901. She died June 17 1901 of malignant invasion of the liver the

autopsy showing this organ to have been converted into a mass of malignant nodules of varying size from a pinhead to that of a large marble. All of the other organs seemed to be free from malignancy.

Withal, however, as we review the results of operative procedure undertaken for carcinoma of the breast, we can warrant the assertion that the present operative technique developed as it has been along the lines of pathologic research has fully verified our expectations and justifies the statement that except in the very acute cases a timely operation radically performed will completely remove the carcinomatous disease and prevent recurrence in the majority of cases.

# THE END RESULTS FOLLOWING OPERATIONS FOR CARCINOMA OF THE BREAST

BY JOHN CHADWICK OLIVER M D

OF CINCINNATI OHIO

P f s s I S g r y i t h M u a m i M e d I C H g S g t h C t P b y  
t r i a d C h r i t H p t a l s

I HAVE assumed in preparing this article that one is expected to confine his observations to patients upon whom he has operated and to give the results of his personal experience. It has been utterly impossible for me to obtain the end results in such a large number of cases operated upon in the charity wards of the hospitals that it seems necessary to omit any reference to patients who could not be followed after they left the hospital. I have therefore omitted from consideration all patients except those private cases whose subsequent histories could be accurately obtained either from personal observation or by correspondence with their family physicians. One cannot present a complete list even of this class of cases either because some of the patients have removed to new localities or the physician who referred the patients to me may have died or removed from his original location.

The histories of the patients herewith reported are complete up to April 1 1907 and I am sure that each statement is based upon authentic information. A tabulated statement is appended for convenience of reference. No case is reported which has not passed the three year limit or has died before the expiration of that period of time. It is possible that the statistics herewith given are somewhat better than has been the average in my work. I believe this to be true because the patients grouped in this report represent the more intelligent class of people as well as those best able to care for themselves.

The complete histories of 35 patients with carcinoma of the breast are presented herewith. Twenty two or 62.85 per cent are dead from recurrence of the disease while 12

| Number | Name    | Time between discovery and operation | Breast affected | Segment of breast involved          | Rapidity of growth    | Glandular involvement at time of operation | Time of recurrence | Sites of recurrence                  | Time between operation and death | Alive                       |
|--------|---------|--------------------------------------|-----------------|-------------------------------------|-----------------------|--------------------------------------------|--------------------|--------------------------------------|----------------------------------|-----------------------------|
| 1      | Mrs B   | 15 months                            | R               | Upper, outer                        | Slow                  | Extensive                                  | 6 months           | Axillary glands opposite breast skin | 2 y, 2 m                         |                             |
| 2      | Miss S  | 1 year                               | R               | Whole breast                        | Rapid                 | Very extensive                             | 3 months           | Axilla and stomach                   | 6 months                         |                             |
| 3      | Mrs F   | 2 months                             | R               | Upper, outer                        | Rapid                 | Extensive                                  | 3 months           | Local and neck                       | 2 years                          |                             |
| 4      | Mrs D   | 1 year                               | R               | Upper, outer                        | Slow, 20 m            | Extensive                                  | 3½ months          | Axilla, liver and pleura             | 4 months                         |                             |
| 5      | Mrs A   | 1 year                               | L               | Upper, inner                        | Rapid                 | Slight                                     | 9 months           | Local and spine                      | 11 months                        |                             |
| 6      | Mrs B   | 3 years                              | R               | Upper, outer                        | Slow                  | Extensive                                  | 4 weeks            | Brain                                | 5 weeks                          |                             |
| 7      | Mrs B   | 6 weeks                              | R               | Upper, inner                        | Very rapid            | Extensive                                  | 6 months           | Liver and stomach                    | 14 months                        |                             |
| 8      | Mrs C   | 20 years, active 1 yr                | L               | Upper                               | Very slow, then rapid | Well marked                                | 1½ years           | Liver                                | 21 months                        |                             |
| 9      | Mrs K   | 6 months                             | R               | Lower, middle                       | Rapid                 | Well marked                                | 14 months          | Axillary glands                      |                                  | Well, 10½ yrs               |
| 10     | Mrs V   | 1 year                               | R               | Lower, middle                       | Slow                  | None                                       |                    | Opposite breast                      |                                  | Well, 10 years              |
| 11     | Miss K  | 1 year                               | R               | Outer, middle                       | Slow                  | Well marked                                | 23 months          |                                      |                                  | 8½ after 1st 7 after 2 oper |
| 12     | Mrs R   | 9 months                             | R               | Outer middle                        | Medium                | Well marked                                | 18 months          | Abdominal viscera                    | 22 months                        |                             |
| 13     | Mrs P   | 3 months                             | L               | Upper, outer                        | Rapid                 | Very extensive                             | 1 year             | Spine                                | 28 months                        |                             |
| 14     | Mrs P   | 6 months                             | R               | Upper, outer                        | Rapid                 | Slight                                     | 2 years            | Scalp                                | 3½ years                         |                             |
| 15     | Mrs W   | 5 weeks                              | R               | Whole gland                         | Rapid                 | Well marked                                | 34 years           | Chest                                | 5 years                          |                             |
| 16     | Mrs M   | 6 months                             | R               | Lower middle                        | Rapid                 | Slight                                     | 3½ years           |                                      | 4 years                          |                             |
| 17     | Mrs G   | 18 months                            | R               | Central                             | Slow                  | Slight                                     | 4½ years           | Local                                | 6 months                         | Well, 6 years               |
| 18     | Mrs T   | 2 years                              | R               | Lower, inner                        | Slow                  | Very extensive                             | 6 months           | Stomach                              |                                  |                             |
| 19     | Mrs H   | 2 years                              | R               | Upper, outer                        | Slow                  | Well marked                                | Income removal     | Axilla                               |                                  | Well, 4 y, 3 m              |
| 20     | Mrs W   | 4 months                             | R               | Upper, outer                        | Rapid                 | Absent                                     | None               |                                      |                                  | Well, 5 years               |
| 21     | Miss F  | 1 year                               | R               | Upper, outer                        | Rapid                 | Very extensive                             | 1½ years           | Liver, kidney, left breast           | 2 years                          |                             |
| 22     | Mrs DeC | 3 months                             | R               | Lower, outer                        | Rapid                 | Slight                                     | 3 months           | Local and lung                       | 1 year                           | Well, 3½ years              |
| 23     | Mrs B   | 8 months                             | R               | Upper, outer                        | Slow                  | Well marked                                |                    |                                      |                                  |                             |
| 24     | Mrs B   | 3 years                              | R               | Upper, outer                        | Rapid                 | Extensive                                  | 9 months           | Not known                            | 15 months                        | Well, 3½ yrs                |
| 25     | Miss H  | 1 year                               | R               | Whole gland                         | Rapid                 | Very extensive                             | 5 months           | Not known                            | 9 months                         | Well 3 y 1 m                |
| 26     | Miss S  | 2 years                              | L               | Whole gland                         | Slow                  | Slight                                     |                    |                                      |                                  |                             |
| 27     | Mrs P   | 15 months                            | L               | Whole gland                         | Medium                | Very extensive                             |                    |                                      |                                  |                             |
| 28     | Mrs W   | 5 months                             | L               | Whole gland                         | Rapid                 | Very extensive                             |                    |                                      |                                  |                             |
| 29     | Mrs W   | 6 months                             | R               | Lower, outer                        | Rapid                 | Slight                                     |                    |                                      |                                  |                             |
| 30     | Mrs S   | 8 months                             | R               | Lower, outer                        | Rapid                 | Slight                                     |                    |                                      |                                  |                             |
| 31     | Mrs McN | 10 years, active 1 yr                | L               | Lower, inner                        | Slow                  | Very extensive                             | 4 months           | Lung, skin local                     | 7 months                         | Well 3 years                |
| 32     | Miss F  | 1 year                               | R               | Whole gland                         | Very rapid            | Very extensive                             | 2½ years           | Above clavicle                       |                                  | With recurrence             |
| 33     | Mrs K   | 1 year                               | R               | Middle outer                        | Rapid                 | Very extensive                             | 4 months           | Local lung, other breast             | 7 months                         |                             |
| 34     | Miss M  | 1½ years                             | R               | Upper, outer                        | Rapid                 | Well marked                                | 8 months           | Spine                                | 1 y, 8 m                         |                             |
| 35     | Mrs W   | 1 month                              | Both            | Lower, outer (L), middle, outer (R) | Rapid                 | Slight                                     | 4 months           | Op breast, stomach                   | 1½ years                         | Well, 5½ years              |

are alive and well from three to ten and one half years after operation (34.28 per cent) One is alive after more than three years but she is at present afflicted with an inoperable recurrence to which she will undoubtedly succumb in the near future

The radical operation with removal of both pectoral muscles but without cleaning out of the supraclavicular region was performed thirty times The breast was removed and the axilla cleared out without removal of the pectoral muscles seven times (The two additional operations are accounted for by the fact that the remaining breast became involved in two patients and these were subsequently removed) Ten of the 30 patients upon whom the radical operation was done have recovered (33 1/3 per cent) while 4 of the 7 upon whom the simpler operation was done are now alive and well (57.1 per cent) These figures are misleading because in two instances a simple operation was done upon the remaining breasts after radical operations had been done upon the opposite ones It is rather remarkable that both of these patients recovered and have remained well—one seven and one half years and the other five and one half years after removal of the second breast

These statistics seem to prove that recurrences and deaths from carcinoma of the breast are unusual after the patient has remained well for three years after the operation In but 3 of the cases has death from carcinoma occurred after three years these lived respectively five four and three and one half years

Three patients developed recurrences or metastases after three years these appeared in four and three quarters three and one half and three and one-half years after operation One of these cases is alive and well one year after the removal of a local recurrent growth The author has met with one fatal recurrence in the axilla fourteen years after the breast had been removed

These very late recurrences open up the question as to what should be called a recurrence and what should be regarded



as a new development of carcinoma. A discussion of this question is not in order under the present circumstances because all such developments must be regarded as recurrences so far as the purpose of this discussion is concerned.

Two or more operations were performed upon 8 of the 35 patients, the secondary operations having for their object the removal of local recurrences of the disease. Three of these are alive and well more than three years after the last operation.

Twenty-one of the 35 patients operated upon had known of the existence of a tumor in the breast for one year or longer. One patient had had a lump in her breast for upwards of twenty years, but it had remained quiescent until one year preceding the operation. Another lady had known of the existence of a tumor in her breast for ten years, but there were no signs of activity until about six months before the operation. In each of these patients the tumor grew rapidly during the active period and malignancy was well marked. Fourteen of the patients who had known of the existence of a tumor for one year or more died ( $66\frac{2}{3}$  per cent). One is alive with an inoperable recurrence, and 6 (28.5 per cent) are alive and well more than three years after operation.

Eight patients knew of the existence of a tumor from six to twelve months prior to operation. Four (50 per cent) are alive and well, four (50 per cent) are dead.

Six had been aware of the presence of a tumor for a period of less than six months. Two ( $33\frac{1}{3}$  per cent) are alive and well, four ( $66\frac{2}{3}$  per cent) are dead.

The figures seem to indicate that one may not be able to judge of the prognosis very accurately merely by the length of time the patient has known of the presence of a tumor in the breast. It must always be borne in mind, however, that a patient's statement on this point is not apt to be very accurate. When this testimony comes from the family physician, or from members of the patient's family it assumes much greater importance. The time given by the patient is always short of the real period of existence.

One remarkable case was that of a lady who had known of the existence of a tumor in her breast for two years. She consulted her local physician and he removed part of the breast the incision not being sufficiently wide of the involved tissues to prevent an early recurrence. I made a radical operation one year later and then removed a local recurrence nine months after the second operation. The patient is alive and well four and one half years after the third operation (Case XIX.)

Recurrence above the clavicle took place in but 2 of the 35 cases. This was less frequent than were recurrences in the opposite breast (5 cases).

Lymphœdema of the arm supervened in 5 of the patients. Three of these died in less than three years, one is alive but with extensive recurrences and very extreme lymphœdema (Case XX.) The swelling gradually disappeared under treatment in the remaining patient (Case XX.)

The function of the arm is good in all of the surviving patients. None of them complain of weakness or inability to use the member.

Twenty eight of the patients comprising the material for this report were married, 7 were spinsters. Ten of the married and 2 of the single women recovered (36 and 28.6 per cent respectively).

Statistics based upon this very limited number of cases indicate that the location of the primary growth has some bearing upon the prognosis. Central growths and those located in the lower third of the breast give a much larger percentage of recoveries than do growths located elsewhere.

The average duration of life after operation (in fatal cases) was twenty months, the extremes being five years and five months.

The average time of recurrence was fourteen and one quarter months—the extremes being fifty six and three months.

An estimation such as the above based upon the mere existence of cancer of the breast without any consideration of the actual conditions present at the time of operation will

give a very fair idea of the average results obtainable in the general run of cases, without any elimination of cases unsuceptible of cure through operative measures. One may, however, in fairness exclude from these statistics those cases in which operation was simply undertaken as a palliative measure, and thus obtain a better idea of what results may be accomplished in cases more carefully selected. This more careful discrimination is only possible through more careful education of physicians and of the general public. Fourteen of the 35 cases in this report were beyond the possibility of cure through operation, and in each of these cases operation was undertaken with the hope of prolonging life or to remove offensive, ulcerated breasts. If we subtract these 14 cases and estimate our mortality upon the cases in which there was a reasonable hope of success we then have 21 patients, 12 of whom recovered—a percentage of recovery of about 57.6.

The matter of prognosis in an individual case will always remain a doubtful one, even though the surgeon has had a very considerable experience with this class of cases. Seemingly favorable cases sometimes progress to a fatal termination, whereas one is sometimes pleasantly surprised by having an unpromising case go on to recovery.

The most potent factor bearing upon prognosis is the character of the growth. The richly cellular, rapidly growing soft, succulent carcinomata are much less amenable to surgical treatment, even when seen early in the course of the disease, than are the more fibrous, slowly growing, hard varieties of the disease. A successful outcome is not probable in the former variety unless operation is undertaken very, very early, because secondary foci of development are planted soon after the primary growth makes its appearance.

One is justified in looking upon the operative treatment of cancer of the breast as being far from an ideal method of treatment, even with the extensive removals practiced at the present time. The hope for the future lies in better prophylaxis and in a better knowledge of the nature of the disease.

## CARCINOMA OF THE BREAST \*

A STUDY OF THE PATHOLOGICAL CONDITIONS AND THEIR  
RELATION TO THE QUESTION OF RECURRENCE

BY ARTHUR TRACY CABOT M D

OF BOSTON

C l i g S g e t t h M s a h t t G e n e r a l H o s p i t a l

My hospital cases have been included in the report made from the Massachusetts General Hospital. The following report concerns only my private cases down to the year 1904. In this series were many advanced cases in which the operation was a desperate effort to prolong life. There was no selection of cases, operation being done in every case that offered except in one where the co-existence of advanced heart disease and a large adherent carcinoma led to palliative efforts with the X ray. The cases were all carefully studied pathologically and the after history has been closely followed. There were forty two cases. All recovered from the operation and of these nine are entirely free from recurrence. The time elapsed since operation in these nine cases has been in 1 case 4 years 1 case 5 years 1 case 7 years 1 case 8 years 2 cases 10 years 1 case 11 years 1 case 14 years 1 case 19 years.

Five other cases are still living though they have had a recurrence of the disease. One of these was operated three years ago three of them were operated four years ago and one five years ago.

The remaining twenty eight cases have died of the disease. Of these seventeen died in one year. Two lived two years. One lived three years. Two lived four years and six lived five years.

Of the nine cases that are well without recurrence the pectoral muscles were removed in two. In the remaining seven the breast and axillary contents were removed without removal of the muscles.

TABLE I—NON-RECURRENT CASES

| No | Age      | Name     | Extent of involvement                                                                  | Duration         | Date of operation | Magnitude of operation                                                                                        | Variety of carcinoma                                               | Time elapsed                       |
|----|----------|----------|----------------------------------------------------------------------------------------|------------------|-------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|
| 1  | About 50 | Miss H   | Nodule size of horse-chestnut No glands in axilla                                      | Some months      | Nov, 1888         | Breast removed and axilla cleaned out                                                                         | Paget's disease                                                    | 19 years                           |
| 2  | 54       | Mrs S    |                                                                                        | 10 years         | Dec, 1893         | Entire breast axilla cleaned out and connective tissue between breast and axilla removed                      | Scirrhus cancer No infected glands found                           | 14 years                           |
| 3  | 60       | Miss S   | Small nodule                                                                           | Recent discovery | Apr, 1896         | Breast removed and axilla cleaned out                                                                         | Scirrhus cancer No infected glands found                           | 10 years Died in 1906 of pneumonia |
| 4  | About 36 | Sister A | Chronic fibrous thickening, one point size of pea showed scirrhus cancer               | Just discovered  | July, 1896        | Whole breast and axillary contents removed                                                                    | Scirrhus cancer No infected glands found                           | 11 years                           |
| 5  | 52       | Mrs W    | Small nodule in breast                                                                 | Some weeks       | July, 1897        | Breast removed and axilla cleaned out                                                                         | Carcinoma of adenomatous type Two lymphatic glands show metastasis | 10 years                           |
| 6  | About 55 | Mrs B    | Irregular rounded growth 2.5 to 3 cm in diameter Skin not involved No glands in axilla | Recent discovery | Apr, 1899         | Breast and axillary contents removed                                                                          | Plexiform medullary cancer No infected glands                      | 8 years                            |
| 7  | About 67 | Mrs M    | Nodule deep in upper outer quadrant 1.5 cm in greatest diameter No glands in axilla    | Recent discovery | Feb, 1900         | Breast removed and axilla cleaned out                                                                         | Adenocarcinoma of mild type No affected lymph nodes found          | 7 years                            |
| 8  | 32       | Mrs P    | A dense nodule about 2 cm in diameter Commencing infection of lymph nodes              | Few months       | Oct, 1902         | Breast and pectoralis major removed axilla cleaned out dissection carried as far as subscapular vessels       | Early cancer of tubular type of alveoli One lymph node affected    | 5 years                            |
| 9  | About 45 | Mrs W    |                                                                                        |                  | Apr, 1903         | Breast and axillary contents removed with pectoralis major and minor and all glands and tissue up to clavicle | Carcinoma Lymph nodes enlarged                                     | 4 years                            |

In the five cases still living with recurrence the muscles were removed with the breast and axillary contents

Of the twenty eight cases that have died the muscles were removed with the breast and axillary contents in twelve cases

In the remaining sixteen cases the breast and axillary contents alone were removed

*Nature of Growth*—In the nine non recurrent cases the disease was usually of a mild type In Case 1 it started as a Paget's disease of the nipple and at the time of removal a cancerous nodule was appearing in the breast beneath Three of the other cases had carcinoma of adenomatous type Three had small scirrhus cancers

One had a small plexiform medullary carcinoma and in one case of unmistakable carcinoma the pathological report has been mislaid and cannot be found In six of these cases careful search failed to show any infected lymph nodes In the other three moderate infection of lymph nodes was found In two cases Nos 1 and 7 of the non recurrent series a little epithelioma of the face co existed with the breast cancer In Case 1 after fifteen years a second epithelioma appeared on the opposite side of the face

In the thirty two cases where the disease recurred the pathologist failed to report condition of glands in three cases In the remaining twenty nine cases there were but three cases in which at the time of the first operation the pathologist reported a failure to find infected glands

From this it will be seen that the instances of non recurrence were in cases of localized disease which had not or had only just begun to invade the lymphatic system On the other hand in the recurrent cases with but three exceptions the lymphatic system was already seriously involved It is interesting to note that in two of these three cases in which infected lymph nodes were not found there was no local recurrence nor involvement of neighboring lymphatics but the symptoms pointed to a distant internal secondary growth In the third of these cases the recurrence was in the supraclavicular glands

Case 19 was interesting from the fact that this patient

TABLE II—RECURRENT CASES

| No | Age         | Name   | Extent of involve-<br>ment                                                                                                                          | Duration     | Date of oper-<br>ation | Magnitude of<br>operation               | Variety of carci-<br>noma                                                                        | Recurrence                                                        | Result                                    |
|----|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------|
| 1  | 28          | Mrs P  | Lump as large as<br>hen's egg over<br>edge of sternum<br>skin adherent<br>Glands in axilla                                                          | 2 to 3 years | 1885                   | Breast and axilla                       | Border line be-<br>tween medul-<br>lary and scir-<br>rhous cancer in<br>affected glands<br>found | Local recurrence                                                  | Died No date                              |
| 2  | About<br>42 | Mrs G  | Tumor beneath<br>nipple which<br>was retracted<br>and hard Ax-<br>illary glands                                                                     | 6 months     | May 1889               | Breast and axilla                       | Cancer with im-<br>plication of ax-<br>illary glands                                             | Operated again in<br>Oct 1889. Lo-<br>cal recurrence<br>in axilla | Died in 1890?                             |
| 3  | 48          | Mrs H  | Small nodule in<br>outer part in<br>volving skin 2<br>pea sized nod-<br>ules near by In<br>axilla small<br>mass of medul-<br>lary looking<br>glands | 4 months     | March, 1890            | Breast and axilla                       | Scirrhous cancer<br>of breast and<br>axillary glands                                             | Probable                                                          | Died in 1892<br>in England<br>of pleurisy |
| 4  | About<br>60 | Mrs S  | Nodule size of pe-<br>can nut Glands<br>in axilla                                                                                                   | 3 months     | 1890                   | Breast and axil-<br>lary contents       | Scirrhous cancer<br>Glands in axilla<br>affected                                                 | Probably first in<br>lung                                         | Died in 1891<br>of recurrence             |
| 5  | 60          | Mrs L  | Dense retracting<br>ing nodule out-<br>side of nipple                                                                                               | Just noticed | Oct, 1891              | Breast removed<br>Axilla dis-<br>sected | Medullary can-<br>cer No infected<br>glands found                                                | Oct, 1905 Oper-<br>ation for recur-<br>rence Supracla-<br>vicular | Died in 1897<br>from recur-<br>rence      |
| 6  |             | Miss F | Large retracting<br>nodule Axil-<br>lary glands<br>much enlarged                                                                                    |              | Nov, 1891              | Breast removed<br>Axilla dissected      | Cancer Enlarged<br>and infected ax-<br>illary glands<br>found                                    | Dec 1894 Prob-<br>ably in medias<br>tinum                         | Died in 1895                              |
| 7  | 60          | Mrs H  |                                                                                                                                                     |              | July, 1892             | Breast removed<br>Axilla dissected      | Carcinoma                                                                                        | Feb and July<br>Operation for<br>recurrence                       | Died?                                     |

| 8  | 4         | M B   | N d u l b t h<br>p p l<br>t h i k t n d<br>b t t d<br>t h r o g h G l d<br>f x u l l | S o m m t h | S e p t 89  | B A t m d<br>i l d e c t d      | C m r o m<br>g l d                                   | N m n f e c t d<br>x u l l          | S m l l<br>p t m<br>f m x u l l<br>897                                          | r o v d<br>m v d<br>x u l l | D d                                 |
|----|-----------|-------|--------------------------------------------------------------------------------------|-------------|-------------|---------------------------------|------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------|-----------------------------|-------------------------------------|
| 9  | Ab t<br>5 | Mrs M | N i p p l<br>l m p l t<br>l y m p h g l d                                            | 8 m t       | 894         | B A x u l l d s s t e d         | D i f m d<br>m p l t i f<br>t h l y m p h t<br>g l d | r r h w t h<br>t i f<br>l y m p h t | R l<br>d l<br>w h                                                               | d l                         | D d<br>i t                          |
| 54 | M G       |       | L S l t t g<br>l y g l d A f                                                         | 9 m t h     | 894         | B A x u l l d t d               | C e r G l d<br>i f t d                               |                                     | O p t i f<br>g l d l<br>895                                                     | f b o<br>895                | O p t i f<br>g l f l w<br>D d n 895 |
|    | N D       |       | C t t d f l g<br>h e r r y b t h<br>p p l S l<br>g l d i x u l l                     |             |             | B A i l d m t d                 | M d l l r y d y f<br>w h m p l t<br>l y m p h g l d  |                                     | O p t i f r r<br>898 P r o b b l y<br>h t                                       | f r e<br>M<br>898           | D d f t e r                         |
| 8  | Mrs H     |       | O m l l d u l<br>m i d l m i f<br>b t                                                | R t l y d   | M r e h 896 | B t d e n t<br>i l c o t<br>m d | T y p i l m                                          | r e                                 | t i p t a l<br>m h A p<br>897 N d l<br>m e d t d f<br>f e r t m<br>M t t m<br>b |                             | D d i A p r i l<br>9                |
| 3  | 6         | Mrs M | D i f f f i b<br>t h l S m l l r e<br>g l d t R d l e<br>G l d l p p l l             | P w w l     | J 896       | B a s t d l<br>l r y t t<br>m d | S c r r h m l l<br>g l d f d                         | f t d                               | S p t 896 N d<br>u l e s m e d                                                  | N d                         | D d f l l f<br>897                  |
| 45 | Mrs P     |       | D i f d l l<br>d f d g r w h<br>o c p l g<br>d b l p t f<br>b t                      | R t l y d   | D 897       | B t m d<br>d x u l l d<br>t d   | M d l l y<br>l y m p h g l<br>f t d                  | N u m<br>d                          | S p t m b<br>l h t                                                              | 899                         | D d 899                             |



TABLE II—RECURRENT CASES—Continued

| No | Age | Name   | Extent of involvement                                                                                                                                                              | Duration     | Date of operation | Magnitude of operation                                                                | Variety of carcinoma                                                                          | Recurrence                                                    | Result             |
|----|-----|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------|
| 15 | 58  | Mrs L  | Extensive hard mass in middle of breast                                                                                                                                            | Some months  | July, 1898        | Breast removed and axilla dissected                                                   | Carcinoma with metastases in axillary fat tissue                                              | Recurrence within a year. Local and general                   | Died in 1899       |
| 16 | 45  | Miss G | Large nodule in breast and palpable glands in axilla                                                                                                                               | Some months  | Sept., 1898       | Breast removed and axilla dissected                                                   | Typical carcinoma, small nodule of carcinomatous tissue found in neighborhood of large artery | Recurrence in pleura                                          | Died October 1899  |
| 17 | 50  | Mrs P  | Diffuse infiltrating growth occupying greater part of corpus mammae. Axillary glands enlarged                                                                                      | Some weeks   | Jan., 1901        | Breast and costal portion of pectoralis major completely removed and axilla dissected | Medullary cancer with lymphatic and probably venous infection                                 | July 1904, in edge of sternum or rib                          | Died August, 1906  |
| 18 | 52  | Mrs A  | Diffuse thickened area occupying about 6 cms in generally fibrous breast. Lymph nodes in axilla                                                                                    | Just noticed | Oct., 1901        | Breast and costal portion of pectoralis major removed. Axilla dissected               | Scirrhous cancer with secondary infection of the lymph nodes                                  | Operation for recurrence in skin May and Oct 1902, 1903, 1904 | Died in Mar., 1906 |
| 19 | 71  | Mrs B  | Small breast with retracted nipple. 2 flat elevated infiltrations from skin. Other breast removed in 1872. Beneath nipple retracting fibrous growth about 2 cms in greatest extent | Some months  | Feb 1902          | Breast and pectoralis major removed. Axilla dissected                                 | Scirrhous cancer with secondary infection of skin                                             | Dec., 1904. Many supraclavicular glands                       | Died October, 1906 |
| 20 | 48  | Mrs E  |                                                                                                                                                                                    |              | April, 1902       | Breast and both pectoralis muscles removed. Axilla cleaned                            | Scirrhous cancer and secondary infection of axillary lymph glands                             | Soon                                                          | Died in Oct., 1902 |

| Abo t M N          | Den                                                                     | J         | B east                                                     | C                                                              | R curren                                                               | D d        | ft  |
|--------------------|-------------------------------------------------------------------------|-----------|------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------|------------|-----|
| 63                 | Den<br>m gl d<br>N gl d                                                 | 9         | B east<br>m gl d<br>Axill l d                              | h us typ<br>nd ted<br>lymph d                                  | bl y i<br>l m n<br>9 4                                                 | D d<br>l 9 |     |
| Ab t Mrs R.<br>58  | Dff ly fibro<br>b eat d i t<br>d d d l<br>m d m<br>terf Gl d<br>vall    | O t 9     | B east with p<br>t li mas<br>d m<br>m d d A l<br>d t d     | Scr r h us<br>d ec d ry<br>nfect f<br>ly lymph<br>n d          | Jun 9 3<br>l re urr                                                    | D d        |     |
| 3 Abo t Mrs B<br>5 | Hard duff m<br>lyl g with<br>A lly gl d                                 | D 9       | B east with p<br>t li m<br>d m<br>m d d A l<br>di ect d    | Dff d oc<br>ci m with i<br>f t n f xcl<br>l ry gl d            | A g 9 4 S<br>erall g gl d<br>k                                         | D d        | 9 7 |
| 4 Mrs II           | A h d d l<br>bot 3 m<br>d m t                                           | D 9       | B east with<br>ill ry d with<br>m d port<br>f p t l<br>m j | Adent m<br>f th<br>h type with<br>m m m g<br>l ry fect         | M y 9 7 R<br>rr l g<br>l ry i<br>d t root f<br>k                       | L g        |     |
| 5 Mrs S            | B t l m t<br>t i ly h rd<br>p d by Axill<br>t m t d d<br>ral h d d<br>l | M reb 9 3 | D t d pe<br>t l m les<br>m d d A<br>l m l d                | M dull ry cu<br>m with l<br>d ry f lymph<br>h m l d<br>p t l m | July 9 3 Lo<br>rr                                                      | D d<br>9 4 | D   |
| 6 M D              | H d t m<br>m i di m<br>t d d m<br>d l t m<br>d xull bo l<br>gl d xull   | M h 9 3   | B t d pec<br>t l m l<br>m d Axill<br>l m d                 | C re m Se<br>ral f t d<br>d l f d<br>xull                      | July 9 6 Arm<br>m h w l<br>M h p                                       | Lt g       |     |
| 7 Abo t M II<br>63 |                                                                         | April 9 3 | B t d p<br>t l m<br>d m Axill<br>m d ed                    | ma                                                             | S pt 9 5 d<br>urr t d l<br>k n d<br>lymph d<br>m d i<br>m d twi<br>9 6 | L g        |     |

TABLE II — RECURRENT CASES — Continued

| No | Age         | Name    | Extent of involve-<br>ment                                                                                                                                                                                                                                                                                                                                                                                                                | Duration   | Date of oper-<br>ation | Magnitude of<br>operation                                                                                                                      | Variety of carci-<br>noma                                                                                   | Recurrence                                                                          | Result                |
|----|-------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------|
| 28 | About<br>58 | Mrs C   | Tumor about 4<br>cms in diam<br>eter beyond<br>limit of mam-<br>mary gland in<br>direction of ax-<br>illa<br>Outer side of nip-<br>ple hard tumor<br>10-15 cm in di-<br>ameter not ad-<br>herent. Sev-<br>eral nodules in<br>breast<br>Large pendulous<br>breast with hard<br>lump in upper<br>part. Glands in<br>axilla<br>Ulcerated sur-<br>face over tumor<br>about size of 5-<br>cent piece Sev-<br>eral enlarged<br>glands in axilla | Some weeks | June 1903              | Breast and pec-<br>toralis muscles<br>removed Axilla<br>cleaned                                                                                | Typical carci-<br>noma A small<br>metastases in<br>one lymph<br>gland                                       | First in Sept.,<br>1905 Operation<br>in 1905 to 1906                                | Living                |
| 29 | 65          | Mrs S   | Outer side of nip-<br>ple hard tumor<br>10-15 cm in di-<br>ameter not ad-<br>herent. Sev-<br>eral nodules in<br>breast<br>Large pendulous<br>breast with hard<br>lump in upper<br>part. Glands in<br>axilla                                                                                                                                                                                                                               | 2 years    | Oct., 1903             | Breast removed<br>with pectoralis<br>muscles Axilla<br>cleaned                                                                                 | Adenocarci-<br>noma with in-<br>volvement<br>of axillary<br>glands gland<br>under pectoralis<br>muscle      | Dec 1904 Much<br>pain in chest<br>both sides                                        | Died                  |
| 30 | 57          | Mrs DeW | Large pendulous<br>breast with hard<br>lump in upper<br>part. Glands in<br>axilla                                                                                                                                                                                                                                                                                                                                                         | 7 months   | Jan., 1904             | Breast removed<br>with pectoralis<br>muscles Axilla<br>dissected                                                                               | Scirrhus cancer<br>with cancerous<br>axillary lymph<br>nodes                                                | Aug 1904 Local<br>and general re-<br>currence                                       | Died                  |
| 31 | About<br>65 | Miss C  | Ulcerated sur-<br>face over tumor<br>about size of 5-<br>cent piece Sev-<br>eral enlarged<br>glands in axilla                                                                                                                                                                                                                                                                                                                             |            | Jan 1904               | Breast and pec-<br>toralis major re-<br>moved pector-<br>alis minor<br>cleaned on both<br>surfaces Axilla<br>dissected                         | Scirrhus carci-<br>noma No in-<br>fected glands<br>found                                                    | Jan 1907 Suspi-<br>cious rheumatic<br>pain and cache-<br>xia No local<br>recurrence | Living                |
| 32 | About<br>36 | Mrs H   | Indurated growth<br>about 3 cm in<br>diameter Breast<br>tissue every-<br>where enlarged<br>and fibrous<br>Several large<br>lymph nodes                                                                                                                                                                                                                                                                                                    | Few weeks  | Feb., 1904             | Breast and pec-<br>toralis major<br>removed and tis-<br>sue in subscap-<br>ular and sub<br>clavicular re-<br>gions dissected<br>Axilla cleaned | Medullary can-<br>cer with gen-<br>epithelial prolif-<br>eration Second-<br>ary infection of<br>lymph nodes | May 1906 Be-<br>neath clavicle                                                      | Died January,<br>1907 |
| 33 |             | Mrs B   | Outer portion<br>breast occupied<br>by diffuse hard<br>growth infiltrat-<br>ing the tissue<br>in all directions<br>Glands in axilla                                                                                                                                                                                                                                                                                                       |            | July, 1894             | Breast and pec-<br>toralis major<br>and minor<br>glands removed<br>from apex of ax-<br>illa and surface<br>of subscapula                       | Diffuse medul-<br>lary carcinoma<br>with involve-<br>ment of axillary<br>glands                             | Recurred locally<br>soon                                                            | Died 1905             |

had had the other breast removed thirty years before for what was believed to be a cancer and this belief was strengthened by the fact that recurrent nodules had been removed on three occasions since the last one fourteen years before the second breast developed the disease. Unfortunately no microscopical examination had been made of any of these specimens.

From this study it appears that in this small series of cases the question of recurrence depended more on the character of the growth and the degree of involvement of the lymphatic system than upon the thoroughness of removal. If the disease had affected many lymphatic glands it was sure to recur even after a thorough removal of all of the muscles and axillary contents. On the other hand in the nine cases that did not show a recurrence the lymphatic involvement was slight in all while in seven out of the nine the muscles were not removed.

These facts give us a basis for a somewhat greater accuracy in prognosis but should not be used as arguments against extensive radical operations for it is impossible in any given case to tell how far the cancer cells have penetrated the surrounding lymphatics and the chance of getting ahead of the disease is improved when the efferent lymphatics have been removed to as great a distance as possible.

In Case 12 the nodule in the breast was small and so situated in the centre of the gland that I felt safe in leaving the pectoral muscles. The recurrence occurred in the muscle thus mistakenly spared and since that experience I have removed the muscle in all cases.

Attention should I think be directed to the danger of recurrence from the self inoculation of the wound with cancer cells set free during operation. This danger is to be reckoned with when a doubtful growth has been cut into for the purpose of establishing the diagnosis before proceeding to its thorough removal. If the lymphatic channels between the breast and the axillary glands or the muscles have been cut across during operation there is danger that during subsequent manipulations cells contained in those channels may be pressed out into the wound. The possibility of this occurring is a reason for

removing breast, muscle and axillary contents in one mass and for keeping the dissection outside of the lymphatic distribution as far as possible. When a cancer has been cut into for purpose of diagnosis the opening should be tightly closed before further operation is undertaken and every precaution should be taken by changing instruments, etc., to avoid inoculation.

Irrigation of the wound may be used on such occasion as an additional safeguard, and in cases where the operation has gone close to the cancer or through suspicious tissues, I have applied tincture of iodine to the surface of the wound after the manner more commonly employed in the presence of tuberculosis, and this procedure has seemed to me to prevent a quick recurrence when such appeared otherwise inevitable.

*X-ray Treatment of Mammary Cancer*—In one case, above alluded to, an inoperable cancer was treated by the X-ray for nearly two years, and it was the opinion of those who watched the patient that the growth was checked and delayed by this treatment. In Case 18, several little nodules appeared in the skin six months after operation. These were promptly removed, but others soon appeared and were again removed only to be followed by still others. The X-ray treatment was then adopted, and under it several nodules disappeared and further reappearance was distinctly checked. For three years under intermittent periods of X-ray treatment the disease made little appreciable progress, but then evidence of deeper trouble in the chest and back appeared and she died four years and a half after the operation.

Case 27 is another in which the X-ray seemed to have a decided effect in retarding the growth. It is now my practice to give each patient a course of X-ray treatment immediately after the operation with the idea of destroying any bits of cancer that may have escaped removal. For this the exposures to the X-ray are made twice a week for three or four months after operation. The cases treated in this way have occurred within the past three years, and are not included in this report, as the time elapsed is too short to judge of results.

# END RESULTS FOLLOWING OPERATIONS FOR CARCINOMA OF THE BREAST

BY LEWIS STEPHEN PILCHER M D

OF BROOKLYN NEW YORK

S e o t t h M t h d t E p p l d G e r m H o s p t l

IN the present communication I wish to emphasize more especially results obtained in cases in which at the time of operation upon the breast the lymph nodes above the clavicle were already infected and the supraclavicular spaces were cleared out in addition to the typical operation upon the thorax and axilla I do this especially because of the frequency with which I have met expressions of skepticism from men of large clinical experience as to the value of extending operative attack above the clavicle their skepticism being based upon their apprehension of the great probability that when the supraclavicular nodes were appreciably affected the infection had already extended into the mediastinum so that even after the removal of the supraclavicular masses the operation would necessarily still be incomplete

No one for a moment would dispute the increase of gravity of prognosis in a case of breast carcinoma in which the transmitted infection had reached the supraclavicular lymph nodes but that this should always render the prognosis practically hopeless is not in accordance with clinical experience When therefore my colleagues say to me that they never invade the supraclavicular region in their work for breast carcinoma I am influenced to inquire whether they are not thereby permitting a certain proportion of cases to proceed to a continuance of carcinomatous development which a further extension of their work of eradication might have prevented

In a study of my results in operations for breast carcinoma published in 1900 I found that in 10 of the cases in which enlarged supraclavicular nodes were discovered and

removed, 3 remained free from recurrence. These I have been able to follow to the present time, May, 1907. One case has since died from cardiac failure at the age of seventy-five, more than seven years after operation, without recurrence of cancer. The two other are still living, free from recurrence, nine and seven years, respectively, having elapsed.

During the six years, 1901-1906, inclusive, 34 additional cases of breast carcinoma have come to operation at my hands, 5 of these were manifestly and unavoidably incomplete operations, the benefit was but partial and temporary and the steady advance of the disease was uninterrupted, one of these died on the table.

In eleven instances, application for relief had so promptly followed the discovery of the presence of the disease, that in my judgment it was proper to limit the operative attack to the clearing out of the axilla and the removal of the pectoral muscles with the affected breast and its overlying skin. The results in these cases have been so extraordinarily good that I almost hesitate to record them, for they entirely reverse all my previous experience and preconceived opinion, nine out of the 11 have thus far remained free from recurrence, periods of four years, three and a half years, two years, eighteen months in 5 instances, and six months, respectively, having elapsed. In the remaining 2 it is reported that there is now a lump in the other breast, the nature of which has not been determined. My reference to these cases is simply *en passant*.

It is the remaining group of cases, 18 in number, in which the evident extension of the disease at the time they first presented themselves was great enough to awaken apprehension of possible infection of the lymph nodes above the clavicle that I wish to dwell upon more particularly. In these cases, in four instances glandular masses in the neck were distinctly palpable before any section of the overlying coverings was made. Of the 14 cases in which the examining finger could not appreciate the presence of diseased nodes in the neck, the section revealed nevertheless that in 11, infected nodes were present, and that in only 3 of the number, appreciable disease

was not recognizable upon section. As to the end results in these cases

Of the 3 cases in which the neck was opened and the supraclavicular region cleaned out without the discovery of any noticeably infected glands in the neck all have remained well to date at periods of five years one and a half years and one year respectively

Of the 4 cases in which the supraclavicular glands were palpable *ante operationem* 1 case died three months after operation without further external manifestation of disease but by progressive asthenia doubtless due to internal carcinoma the operation evidently having been an incomplete one

The second case one year later had developed multiple recurrent nodules in the thoracic region these were kept under control by X ray treatment for two years. At the end of four years she had developed a growth in the remaining breast and was subjected to a complete operation for its removal later she developed intrathoracic metastases from which she died five years after the primary operation

In the third case a suspicious nodule developed upon the thorax within the first year after operation this disappeared under the influence of the X ray and the patient thereafter remained in good health for two years at the end of which time she died as reported from pneumonia. The case is not altogether free from the suspicion of a carcinomatous element in the pulmonary condition

The fourth case remains well without suggestion of recurrence two years after operation

The 11 remaining cases in which the neck was opened and infected glands found to be present although they were not palpable until after the neck was opened belong likewise though in a less degree than those first mentioned to the group of neglected cases which experience has shown may be expected to differ greatly in the operative results obtained from the early attended cases

Among the 11 women the length of time that had been allowed to elapse after the presence of the growth was known



before accepting operation for removal, was two years in 1 case, between one and two years in 4 cases, six months in 4 cases, and one month in 2 cases only. It has been possible to follow the later history of all but one. One died from myocarditis seven weeks after the operation, leaving 9 cases to be accounted for, of these, 3 developed speedily both regional and distant metastases, the removal plainly having been incomplete, and they all died within the year, a fourth was reoperated at the end of a year for a recurrent nodule in the lateral thoracic region, no further external metastases became manifest in this case, but carcinoma of the liver developed, resulting in death three years after the primary operation, a fifth case remained well for four years, but during the fifth year—the present year—there have developed both supraclavicular and thoracic recurrences,—she is still living. Four cases still remain free from recurrence, at periods of three years, three years, two years, and one year, respectively, since operation.

In two previous papers, in 1902 and 1905, respectively, I have dwelt upon the importance of opening the base of the neck as a part of the routine operative procedures in cases of breast carcinoma. Even the limited experience contained in the comparatively small number of cases included in my own statistics, is sufficient to indicate that in a considerable proportion of cases the supraclavicular nodes become early infected, so that operations for the removal of carcinoma originating in the breast must often be incomplete if the base of the neck be not cleared of its nodes, as well as the axilla. The point of suspicion—the key to the whole situation, in many cases—is the triangle at the junction of the subclavian and internal jugular veins, where rest the node or nodes which guard the entrance to the mediastinal lymphatic paths and to which run not only the lymphatics which pass up under the clavicle from the axilla, but also an inconstant but not infrequent set of ducts which run up on the front of the thorax from the mammary region to the base of the neck, down into which they dip after running over the inner end of the clavicle.

When the neck is opened this jugulo subclavian triangle is first to be exposed explored and cleaned and from it outwards the lymphatic bearing tissue can be best systematically dissected out *en bloc*

So dense is the deep fascia at the base of the neck that together with the overlying adipose tissue and skin it forms a covering which renders infected nodes difficult to detect by palpation until they have attained quite a size When such nodes have become distinctly palpable or visible the presumption is that the infection is of long standing and of considerable extent They are of ominous portent and fully justify the gravest prognosis That even then the infection may still be confined to the accessible supraclavicular group so that their extirpation may ensure a complete removal of all carcinoma bearing tissue has been demonstrated in enough instances to encourage surgical attempts in all but the plainly hopeless cases Of more importance however is the practical recognition of the probability of the presence of infection of the supraclavicular nodes in every case of breast carcinoma of much duration or extent and the incorporation into the general plan of operative attack in all such cases of an incision into the base of the neck and a systematic removal of all possibly infected tissue even though there may be no distinct evidence to sight or touch before such incision of the presence of such infection

# VERY LATE RECURRENCES AFTER OPERATION FOR CARCINOMA OF THE BREAST

BY JOSEPH RANSOHOFF, M D , F.R C S (ENG ),

OF CINCINNATI, OHIO,

Professor of Anatomy in the Medical College of Ohio, Surgeon to the Cincinnati and to the  
Good Samaritan Hospitals

WHEN Volkman more than twenty-five years ago established the triennium as the time limit for recurrence after operations for cancer, it was with the knowledge that it may return at a later period. Investigations have recently been made, especially on the Continent, by Labhardt, Koenig, Poulsen, Schroder, and Wunderli of the subsequent history of cases that have passed the three-year limit. Their facilities for such investigations have been unusual by reason of the registration laws which through official sources permit the following up of cases to the very end. From these investigations it will appear that of those who have safely passed the three-year limit about 20 per cent succumb later to recurrence in loco or to visceral, bone or gland metastases. It would seem, therefore, that before a permanent cure can be said to have been obtained an immune period of five or six years must have been passed. But, as we shall see later, even long after this time, local glandular or visceral metastases may appear.

The mortality of even very extensive breast operations has been steadily reduced until now they can hardly be classed with the major operations. Synchronously the number of patients who remain well after three years or more has increased. The average of patients who pass the three-year limit in the hands of most surgeons who perform radical operations is but a little under 30 per cent. A three-year cure of over 40 per cent is certainly exceptional unless conservatism is manifested in the selection of cases deemed suitable for complete operation. The age of the patient, the degree of glandular involvement, the size and rapidity of the tumor growth

and above all its cell elements will greatly effect the prognosis as to recurrence. Experience has taught us in the individual case to foretell with reasonable accuracy how lasting the relief afforded by operation may be.

It is altogether probable that a fair part of the improved end results latterly achieved is due to the fact that the public has for over twenty years been educated to the importance of early interference in breast cancer. It is now exceptional in the experience of anyone to encounter an ulcerated or even adherent mammary cancer and a primary inoperable case in well settled communities is indeed *rara avis*. In advanced cases the post operative prognosis is still extremely bad. Of 31 ulcerated breast cancers Wunderli reports only 2 living after three years.

To ascribe the improved results altogether to the radicalness of the operation I believe to be fallacious. My first case of breast amputation is still living and well after twenty nine years and I have two living and well operated on twenty six and twenty two years ago respectively. In the last of these a very severe wound erysipelas threatened the life of the patient. It goes without saying that in each of these cases the pathologic diagnosis of cancer was made. In none of them was more than an amputation with incomplete evacuation of the axilla done.

This is not in any way to be construed as advocating recession from the practice of widest possible excision now in vogue by almost everyone but as some basis for hope even in those exceptional cases in which for one reason or another a very extensive operation is contra indicated. On the contrary the radical operation of to day if properly done reduces considerably the danger of local recurrence although it of course in no way can affect metastases already existing. How long these metastases may lie dormant will be seen later. The danger of the modern operation is in the inoculation of the wound by the needless manipulation of the tumor mass by an inexperienced or clumsy operator. Almost everyone who does surgery at all feels himself competent to do a breast operation.

which to do properly, in my judgment, is one of the difficult feats of surgery. I believe that I have seen relatively more cancers en cuirasse follow speedily after the radical than the older methods of operation. I also believe that if surgeons would more generally clean out the axilla as the first step of the operation, the results would be better, although I have no statistics upon which to base this view.

However much wide excisions have reduced the probability of local recurrence, this will always continue to be an obstacle in the way of getting much better results. From the statistics of seven German clinics where it was possible to follow the cases, I have figured out that local recurrence takes place in about 58 per cent of the cases, and that of these again in 62 per cent the recurrence appears during the first year, in 11 per cent in the second year and only in 5 per cent in the third year. In these percentages are included metastases in the axillary and cervical lymphatics which form but a small proportion of the total number of cases. The great preponderance of recurrences takes place in the scar or in the skin in its immediate vicinity. These facts, clearly elementary in character, are only mentioned as a predicate to the statement that after the third year freedom from local recurrence, although not assured, may at least be confidently hoped for.

Recurrences after this time become less and less frequent. Of 20 cases collected by Margraff, 12 took place in the third and fourth year, 4 in the fifth and sixth year, 2 in the seventh or eighth year, and 2 in the ninth and eleventh year. Of 17 recurrences from the clinic at Rostock, 5 took place in the fourth year, 4 in the fifth, 3 in the sixth, 3 in the seventh, and 1 each in the eleventh and thirteenth year. The latter to me seems a doubtful case since without local recurrence the cancer developed in the inguinal glands and the patient succumbed to abdominal metastases.

In the preparation of this paper I have had communications from sixty-two fellows of the society with mention of thirty-seven cases of recurrence after six years. No less than eighteen of my colleagues in the association who responded

had not seen or did not recollect cases which had recurred after five years. It is self evident that these reports fall far short of scientific accuracy but in a general way from the very wide experience which they reflect they emphasize the fact that after that period recurrences are certainly unusual.

Of late recurrences Warren Carson Bevan and Senn each report a case of eight years. Shepherd 1 of nine and one of eleven the latter in the supraclavicular glands. Ochsner 1 of eleven years. Bell 1 of ten years. Bloodgood 1 of fifteen years. Moore 1 of twelve years. M. H. Richardson two of seven and 1 of eight years. Vanderveer 1 of twelve years and six months. McLaren 1 of thirteen years. exitus of general carcinoma. Pilcher 3 of five or six years. Coley 1 of seventeen years. Armstrong 1 of fifteen years. Bull 1 in loco after eight years and 1 of general metastases after nineteen years. Curtis has recently reported 5 cases of late carcinomatous metastases. Of 27 cases kindly abstracted for me by Harrington from his service there was 1 dying eleven years after operation from cerebral hæmorrhage without local recurrence. The patient was seventy five. There was no reason for believing that the apoplexy was due to hæmorrhage. There was no case of late recurrence.

Willy Meyer communicates a case of gastric cancer appearing six years after breast amputation without local recurrence and Tiffany one of intestinal and omental cancer twelve years after breast operation without local recurrence. Finney had 1 of cancer of the rectum seven years after the operation without local recurrence and Jacobson communicates 2 cases of abdominal carcinoma developing thirteen and sixteen years after the primary operation. In neither case was there local recurrence. In the one case multiple metastases were found in the liver without any other organic abdominal disease. Halsted reports 1 case of cancer of the pleura developing eight years after the operation without recurrence in the scar and Mayo 1 of cancer of the other breast which developed seven years after the first operation.

My personal experience with late recurrences or metas

tases has been limited to a few cases There may have been others of which I have no knowledge

Mrs S L, aged forty-eight Cancer of the right breast Amputation with removal of axillary lymphatics in April, 1881 Continued well for four years when symptoms of cancer of the spine developed, to which she succumbed six years after the operation

I have seen a second case of metastatic spinal cancer in a woman of forty The symptoms developed about eighteen months after the primary operation for breast cancer The patient died ten months after the inception of the spinal symptoms There was no local recurrence

In a personal communication DaCosta mentions a case of spinal cancer which developed nine years and ten months after an operation by the younger Gross, who was a pioneer in the practice of wide excision of breast cancers There was no local recurrence

A doubtful case was that of Mrs L, on whom a radical breast operation was done at the Jewish Hospital January 31, 1897 She continued well for nearly six years when without local recurrence cerebral symptoms developed Their onset was sudden and consisted of right hemiplegia and aphasia There was no loss of consciousness The patient lived four months I would exclude this from the list of metastases and consider it one of ordinary cerebral embolism were it not for the following case recently in my service at the Cincinnati Hospital

The patient, a lad of nineteen, entered with a rapidly growing periosteal sarcoma of the upper end of the right humerus On the day before the one set for operation the patient complained of intense headache, became comatose within twenty-four hours and died thirty hours after the onset of the cerebral symptoms There was no paralysis of the extremities The autopsy revealed a metastatic growth as large as an olive in the left cerebellar hemisphere A hæmorrhage had broken through the growth under the pia and into the fourth ventricle Similar pigmented metastases were found in the lung, the spleen, the kidneys and one in the right pararenal fat

Of cancer of both breasts I have had two cases. In one the second breast was removed four years and two months after the first operation. Recurrence ensued within a year.

The second case was that of a woman of forty-two, the mother of four children. The right breast and axillary glands were removed at her home in Peru, Ind. in June of 1887. In 1894 the left breast was removed for scirrhus. Sixteen months after this operation a cancerous growth was removed from the axilla of the side first operated upon. There has been no recurrence since and now the patient is enjoying the best of health.

Of the appearance of carcinoma in other organs after breast operations I have had but one case and even in this the later history did not come directly under my observation. It was that of a woman of forty-eight who developed a cancer of the uterus seven and a half years after the first operation. Her physician could not persuade her of the independent nature of the uterine cancer and she refused operation.<sup>1</sup>

A remarkable case as to the length of the interval between operation and recurrence is that which follows.

I first saw Mrs. F. in March 1904. She was then sixty-three years of age. She had given birth to five children. In May 1883 Prof. T. A. Reamy at his private hospital removed the right breast for carcinoma of the scirrhus type. The axillary glands were not invaded and the operation consisted of wide excision of the breast without opening the axilla. A microscopic examination confirmed the clinical diagnosis. The patient remained well until four months before her visit to me when she observed a painless lump in the scar. The tumor grew rapidly from its first appearance.

Her condition at the first examination was one of perfect health except for the cancer recurrence in the region of the right breast. The scar very irregular and broad was a little over

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<sup>1</sup> In May 1893 the writer removed a round cell sarcoma from the left axilla of a man seventy-three years of age. Without any local recurrence a tumor developed on the outer side of the left arm which I removed in May 1907. The tumor proved to be a melanoma sarcoma.



6 inches in length and had evidently formed after healing by granulation. Here an irregular nodular tumor of stony hardness and adherent to the muscle was found. The skin over it was purplish in spots, adherent to the mass and quite glistening. The tumor could just be covered with the palm of the hand. Except for the patient's statement, which there was no reason to question, nor by reason of her very superior intelligence was there cause for doubting the accuracy of the observation, it did not seem possible that such rapid growth could have taken place in four months. The axillary glands were not at all involved. On April 2, 1904, at the Jewish Hospital the entire scar together with the tumor and the sternal part of the large pectoral muscle was removed. By plastic operation and slight skin grafting the wound was closed. The axilla was not disturbed. An examination of the specimen showed it to be a scirrhus recurring in the scar. On April 23, 1905, two recurrent nodules were removed from the site of the scar left from the second operation. Local recurrence did not take place. Death resulted on April 9, 1907, from intra-thoracic cancer which had caused intense dyspnoea. There was no pleural effusion. Her physician, Dr W H Kelley, informed me that ten days before her death a large mass could be felt in the region of the liver. On account of the condition of the patient no effort was made to accurately localize it. No autopsy was made.

So far as I have been enabled to glean from a rather extensive investigation of the literature, this case presents the longest interval of freedom from recurrence hitherto reported. The interval between operations was one month less than twenty-one years. In a personal communication Deaver informs me that he has knowledge of one case which had recurrence twenty years after the removal of the breast. Matas writes me that he saw a woman seventy-six years old who had a tumor appear in the cicatrix of an operation for breast tumor performed by another surgeon about twenty-five years before. The axillary glands which had not been removed at the first operation were not involved.

Tiffany speaks of a case recurring from time to time during a period of twenty-one years. The first operation was

done by Sir James Paget Death resulted from cancer en cuirasse

The summing up of the cases communicated to me and my own shows 37 developing seven years or more after the first operation for cancer of the breast Of these 26 were clearly local recurrences and 11 were doubtful Among the local recurrences I included those in which the regional lymphatics of the axilla the neck or the thorax were involved Perhaps even some of the abdominal recurrences unless clearly primary in the viscera may be due to retro infection of the lymphatics Of the cancers of the other breast there were 3 cases To classify these as recurrences is hardly logical The same is true of the cases of cancer of the rectum of the stomach and of the uterus With predisposition and environment unchanged a primary growth may certainly occur in any organ after many years without reference to a growth elsewhere removed years before Late metastases without local recurrence as in a case of Bull's of ten years in the brain of cancer of the spine after ten years and of the liver after thirteen years without local recurrence and without any recent primary growth in any other viscus must on the other hand clearly be classified with the metastatic recurrences Of clean local recurrences 10 occurred during the seventh and eighth years 2 after the ninth tenth eleventh twelfth and fifteenth years and 1 each at varying intervals from fifteen to twenty five years Even in these late recurrences the tumor growth was in the scar or its immediate vicinity and it is worthy of record that in some of the cases of longest standing there was no axillary involvement even at the time of the recurrence This might cast some doubt upon the nature of the growths as to cancer although the very fact of recurrence bears out the correctness of the clinical diagnosis of the primary tumors and the pathologic findings when made Especially in cases where the absence of axillary lymph node involvement is noted the suspicion of a chronic mastitis or of some form of abnormal breast involution would seem justified But here again the recurrence speaks for the malignancy of the initial growth

The explanation of these late local recurrences is largely speculative. The trend of opinion is that since, irrespective of the length of the interval they recur with great uniformity in the scar or the skin about it, they must result from cell deposits left at the first operation where they have remained latent. Clearly as this is opposed to our notions of the activity of the cancer cell, recent investigations, notably by Peterson, have shown that retrograde changes can take place in cancer nodules chiefly through the agency of giant cells and that the operation fosters this process. If and when this process fails, recurrence ensues.

In conclusion, I am inclined to believe that all supposed very late recurrences in the scar are not such in reality, for there is one factor worthy of consideration. It is that scar tissue with its epithelial covering and deformed glandular tissue in its vicinity is subject to diseases of its own and that among them cancer is not uncommon. Why should it not occur, therefore, *de novo* in the scar of an old breast operation just as it occurs in the cicatrix of a healed gastric ulcer or in that of a torn cervix?

# CARCINOMA OF THE BONES FOLLOWING CARCINOMA OF THE BREAST \*

BY HENRY R WHARTON M D

OF PHILADELPHIA

Surgeon to the Presbyterian Hospital

Mrs F aged sixty one years consulted me in January 1906 in regard to a tumor involving the left breast which had been giving her some uneasiness for several months Upon examination I found a distinct mass in the substance of the breast which I considered carcinoma and advised its removal The breast was removed with axillary glands in February 1906 and the patient made a good recovery Three months after the removal of the growth the patient complained of pain in the lumbar region of left side extending into the left thigh this pain was intermittent She passed out of my observation in June when she went away for the summer but returned to my care in October She stated that she had suffered quite severely at times during the summer from pain in the lower lumbar region and thighs At this time she was not able to walk well without the aid of crutches Walking became more difficult and she finally was compelled to abandon it entirely although she was able to sit in a chair After sitting for a time she complained of pain in lumbar region Examination of the back showed no kyphosis but there was tenderness on pressure over the lower lumbar vertebrae and sacrum and pain over the trochanters The pain also extended to the thighs as far as the knee joint There was no paralysis of the lower extremities and the knee jerks were normal There was no loss of power in the bladder or rectum The pain was intermittent and was described as acute at times and sometimes dull in character The temperature was slightly elevated for a few weeks before the patient's death There was no evidence of any recurrence of the growth at the seat of operation

After repeated examinations and a careful study of the case it was thought probable that her symptoms were due to a sec

ondary carcinomatous growth in lumbar vertebræ or sacrum Dr H A Hare, who saw the patient with me upon two occasions, was inclined to this diagnosis During the last month of her life the patient was kept comfortable by the use of a moderate amount of morphia Death occurred suddenly from angina pectoris on January 7, 1907

*Autopsy*—The lower lumbar vertebra was found much softened, and cord and dura were thickened Report of the microscopical examination of the fifth lumbar vertebra, cord and dura, made by Dr A G Ellis, was as follows

"Sections from the fifth lumbar vertebra show at points marked erosion and disappearance of the osseous structure which remains only in the form of isolated, irregular fragments In these areas is a new growth made up of spheroidal epithelial cells and an irregular fibrous stroma The nuclei of the former react well to stains, the protoplasm is in many instances granular and fragmenting In a few areas are fairly distinct alveoli bounded by fibrous tissue and containing masses of the described cells Tissue of this type surrounds many of the fragments of bone and extends into the overlying soft parts

"Sections from the spinal dura in the region of this vertebra (4) show at one circumscribed point a decided thickening Here the membrane is twice the thickness of the remaining portion, the increase being entirely due to fibrous tissue, epithelial elements being lacking This area corresponds to the thickening of the dura noted macroscopically at the extreme lower end of the removed portion

"*Diagnosis*—Fatty degeneration of heart, scirrhus carcinoma of lumbar vertebra, chronic productive pachymeningitis of overlying dura"

Dr B F Curtis<sup>1</sup> reports a case of carcinoma of the vertebra following removal of the breast for carcinoma In this case, seven months after removal of the breast, loss of power over the bladder and rectum was observed, the knee reflexes were lost, and there was paralysis of the parts below the line of the umbilicus There was also kyphosis in the mid-dorsal region Pain was not severe Laminectomy was performed, and upon exposing the cord it was found congested, the sixth dorsal vertebra was softened and projected slightly into the spinal canal The pressure symptoms were not relieved by the operation The patient died sixteen days after operation

Primary carcinoma of bone is extremely rare, whereas

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<sup>1</sup>N Y Med Record, 1898, vol 1, p 347

secondary metastatic carcinoma of this tissue is not uncommon. The occurrence of metastatic carcinoma of bone following primary carcinoma of the breast is well recognized. The infection may occur months or years after the removal of the primary tumor. The character of the secondary tumor always corresponds to that of the primary one. The infection of the bone may occur by direct extension of the growth to this tissue when it originates in tissues adjacent to the bone as is not infrequently seen in involvement of the ribs in recurrent carcinoma of the breast.

The development of carcinoma in bone distant from the primary growth results from the localization of carcinomatous emboli and is said to occur at that portion of the bone subjected to the greatest traction or pressure. Carcinomatous infiltration of bone causes diffuse lacunar absorption rendering the bone soft and easily bent or broken. There may also be present at the seat of infiltration a tendency to the development of new bone tissue; this condition has been described as osteopathic carcinosis.

According to von Recklinghausen the bones most frequently the seat of secondary metastatic carcinoma are the vertebræ, femur, ribs, humerus and cranial bones. The vertebræ are said to be not infrequently the seat of carcinomatous infection from carcinoma of the breast, but my personal observation of a large number of cases has shown only one case in which the vertebræ were involved. On the other hand Dowd reports 29 cases operated upon for carcinoma of the breast in 5 of whom symptoms of spinal metastasis developed. It should however be noted that no autopsies were recorded in any of these cases.

My experience with secondary carcinoma of the bone following carcinoma of the breast located at points not adjacent to the primary growth has been confined to the following cases:

CASE I—Carcinoma of the lumbar vertebræ in the case previously reported.

CASE II—Carcinoma of the left clavicle in a woman of fifty years, which developed five months after the removal of the left breast. In this case the patient complained of pain in left clavicle, which was fractured while turning in bed. In this case a marked tumor developed at the seat of fracture before her death, which occurred two months subsequently.

CASE III—A woman, aged forty-five, removal of breast for carcinoma, in whom six months subsequently there were no signs of local recurrence, but the patient complained of pain in both femora. One morning while sitting in a chair both femora were fractured, apparently by muscular action. This patient before her death, which occurred two months later, developed a tumor of the right humerus and one of the left parietal bone.

CASE IV—Woman of fifty years, who had had right breast removed for carcinoma, who, eight months after the removal of the breast, fractured her right femur while turning in bed, and developed a large spindle-shaped tumor at the seat of fracture. Death occurred several months after the appearance of the tumor of the femur.

CASE V—Woman, aged fifty-five years, who while walking in her room felt the left leg give away under her, and she fell to the floor. When I saw her a few hours later I found a marked tumor at the middle of the left femur, mobility and crepitus were marked. Upon questioning her, she said she had for some months suffered from pain in the left femur and a painful tumor of the left breast which had never been operated upon. Upon examination of the breast I found a firm tumor involving the left breast, adherent to the skin, which presented the typical pig-skin induration. This patient died several months later of pulmonary metastasis.

The most prominent symptoms of metastatic carcinoma are localized pain, which may be dull or acute in character, and thickening of the bone at the seat of infection. The former is most common, and should direct attention to the occurrence of this affection. In this affection of bone, operative procedures offer little chance of relief, although in cases involving the spine, where pain and pressure symptoms are marked, as in the case reported by Curtis, it would seem justifi-

fiable to resort to operation if only for temporary relief of the symptoms. In cases involving the long bones the possibility of fracture which adds greatly to the patient's discomfort should not be overlooked and the patient should as far as possible be carefully guarded against the occurrence of this accident.



# THYMUS GLAND TREATMENT OF CANCER \*

A PRELIMINARY REPORT WITH A PRESENTATION OF A CASE OF INOPERABLE  
CANCER WITH GREAT RELIEF OF SYMPTOMS

BY FREDERICK GWYER, M D,

OF NEW YORK, N Y,

Surgeon to Bellevue Hospital

THE case herein reported was referred to me by Dr A E Isaacs of this city on April 1, 1907 The essential history of the case is as follows

Mrs B, aged forty-eight Married Noticed the first appearance of a cancer in the left breast in 1899 She was operated on by Dr Ellsworth Eliot, Jr A second operation was performed by Dr Eliot in June, 1906 A recurrence seems to have taken place immediately after, and she was treated for about three months by X-rays without result

About two or three months ago she noticed the disease had involved the supraclavicular glands on the same side She eventually consulted Dr Isaacs who considered it to be an inoperable case and referred the patient to me

At her first visit, which was on April 1, 1907, I found the following conditions

1 Pain in the shoulder region, in the arm, and in the breast region and scar, so great as to prevent sleep at night

2 One or more glands just above the breast scar A matted mass of glands beneath the clavicle, filling and bulging the sub-clavicular space

A mass of glands above the clavicle with several isolated glands in the neck region The supraclavicular mass was about the size of a hen's egg, matted together and painful to the touch

Several glands in the right side of the neck and some of considerable size in the right axilla

3 The shoulder and arm showed marked swelling extending

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\* Paper read and case presented at the meeting of the New York Surgical Society on Wednesday, May 8, 1907

to the dorsum of the hand which was puffy. The patient was disinclined to move the arm from sense of weight and pain.

Treatment was begun on the date mentioned and continued until April 25, 1907. The patient within forty-eight hours reported diminished pain and ability to sleep. The swelling of the glands, shoulder and arm began to subside and she moved and used her arm more freely.

On April 27, 1907, her temperature which had been normal until then shot up to 102 degrees F and continued elevated until May 4, 1907, reaching at times as high as 104 degrees F. It subsided and became normal on the date last mentioned. A peculiarity noticed was that the pulse was at no time above 90 and always of good character.

During the fever she had pain at times intense at the free border of the ribs on the left side and the spleen seemed moderately enlarged. She was confined to her bed. During this time the patient was cared for by Dr. John Block, whose treatment was mainly observation. Quinine was given in doses of 20 grains a day without effect. Salol was being administered during the last days of the fever.

During the period of fever, about nine days, there was continued diminution in the size of the glands.

She has been free from fever since May 4, 1907, nearly free from pain, is slowly regaining her appetite and strength and to-night shows of all the different masses of glands only two slightly enlarged, above the left clavicle and two above the right. The swelling of the arm and shoulder region has disappeared. The amount of reaction is shown by her weakness and a loss of 10 pounds in weight in ten days. In verification and as additional testimony I herewith give a letter just received from Dr. Isaacs.

NEW YORK, May 7, 1907

Dear Doctor Gwyer,

I have seen Mrs. B—— today and report herewith the results of my examination.

The practical disappearance of the supraclavicular glands is the most notable feature, as the enlargement of and pain in these glands was the most prominent symptom when you began your treatment. You will recall that at that time they formed a visible mass about the size of a small chicken's egg to the feel, with a more or less boggy infiltration of the adjacent tissue. This mass has practically entirely disappeared with the small excision I will mention later. I want to remark here the conditions on

my previous examination, while she was under your treatment and before her attack of fever. At that time, the previously existing boggy mass had disappeared, the tumor itself had reduced to about half its original size, and in place of the homogeneous oval-shaped mass previously felt, there could now be appreciated three distinct enlarged glands almost separated from one another. To go back to the present condition, the small reservation I want to make as to the entire disappearance of the mass, is that there is yet to be felt on deep palpation, behind the clavicle, some small irregularities that give the impression to the palpating finger that they might be the broken down remains of some of the glands, they have not the smooth feel and globular outline usual to enlarged lymphatics.

The next feature of note is the entire disappearance of the œdema, pain and general loss of function of the arm, forearm and hand. There is now practically no difference between the two upper extremities, whereas previously the œdema, etc., were quite marked.

The character of the tissues on the anterior chest wall, above and below the scar and in the axillary space, is markedly changed. Whereas it was hard and brawny before, almost pitting on pressure, with some infraclavicular and axillary glands indistinctly palpable, and skin immovable on underlying chest wall, it is now soft and normal with no swelling and no appreciable glands.

The supraclavicular gland on the opposite side is yet palpable but decidedly smaller than it was. The woman is quite weak, I suppose as the result of her recent severe and protracted spell of fever, but she is gradually recovering her strength. There is quite some tenderness yet on pressure over the parts which had been affected, especially where there seems to be any remains of the process, as in the supraclavicular regions on both sides.

Very truly yours,

A. E. ISAACS

It is not claimed that the patient is yet cured, but it may be fairly claimed, I think, that the cancerous process has been arrested and its clinical evidences greatly reduced. And there is ground to hope for the ultimate cure of the patient.

Treatment will not be resumed until the patient is strong enough to stand another period of auto-intoxication and elimination.

The treatment given in this case, and in others to be touched on, was the thymus gland, either dried and ground to powder, or as a watery extract of the nucleoproteids and other elements. The dose of the powder varied from one to four drams three or four times a day, with sodium phosphate half an ounce once a day for eliminatory purposes. Meat was

permitted sparingly but milk eggs starches sugars and some fats were allowed in the diet

In addition to the above case I have another of X ray burns of the hands in which cancer developed and was repeatedly removed which I have treated intermittently for the last year There has been no return of the disease the color of the skin has become normal its resistance to irritation increased and the precancerous changes which were so noticeable during the previous five years have not reappeared

Another case from Drs Hotchkiss and Hawkes cancer of the penis with recurrence in the groin a hopeless case had received morphine as desired after treatment with thymus was begun the patient was fairly free from pain and the growth showed a decided diminution before his death

Another case from Dr Tilton cancer of the larynx with secondary involvement of the neck glands inoperable showed under treatment a marked diminution in size of the glands Breathing was so bad the patient was sent in to Bellevue for immediate tracheotomy He improved so much under thymus treatment that tracheotomy was not performed until a month later when and owing to a streptococcus infection occurring his trachea filled with pus and debris and he eventually succumbed He too was fairly free from pain after medication was begun Dr Tilton permits me to state that he considered the reduction of the glands very remarkable

Another case from Dr W G Thompson cancer of the rectum inoperable has been under treatment for six days Before treatment morphine was administered for pain which was great Since treatment was begun there has been no pain and an examination to-day by Dr Frink my house surgeon and myself shows a diminution of the growth as evidenced by a larger lumen and a slightly greater mobility of the mass The patient feels well and sits up in bed

Another case from Dr Hitzrot adenocarcinoma of the breast operation by Dr Bolton recurrence in the supraclavicular and other glands has just been started on treatment and in four days the glands of the neck show a slight reduction and

the marked oedema of the upper extremity and which extends to the dorsum of the hand, is softer than it was. She reports that half an hour after taking each dose of thymus there is a feeling of fulness amounting to an aching pain in the affected regions, this feeling lasts from one to one and a half hours. Another symptom, one which I have observed in other cases, is that while her appetite is good, it is more easily satisfied.

Another case, from Dr Isaacs, removal of the breast, recurrence in the supraclavicular glands, inoperable, improved under treatment while it lasted. The patient was impatient and uncontrollable and the case was under observation but a short while.

Of course I fully recognize that the treatment in these cases has been too brief to demonstrate anything except the local improvement which has taken place during it, and I mention them only to show that improvement, to illustrate certain associated features, and it is hoped as a basis for subsequent report.

I have used the dried thymus gland of the calf, and also a watery extract of the gland containing the nucleoproteids and an amylolytic enzyme. This enzyme, which is in quantity and powerful, seems not to have been discovered before, as I can find no record of it in my extensive reading. It will be taken up further in a future communication.

The glands were received fresh, fat removed, cut up and dried at a low temperature by a forced draft of air, then ground and sifted to a uniform powder. This was administered stirred in water about an hour before meals.

The watery extract may be prepared from the dried gland as follows.

To eight ounces of a solution of sodium chloride (four grains to the ounce) add a dram of the dried powder, and a little thymol. Frequently agitate for one hour. Strain and filter as rapidly as possible. After filtering twice, acetic acid - 50 per cent C P is added, using a 20 per cent solution, with stirring, until a point of acidity is reached which gives good

flocculi on standing a minute or two. The precipitate is separated by filtration and redissolved in a solution of sodium carbonate (three quarters of a gram to the ounce of water) using about one and a half ounces of the solution. This solution is filtered twice and to it is added acetic acid to acidity and good precipitation.

The precipitate is again separated by filtration and redissolved in a solution of sodium carbonate (one gram to the ounce of water) using two drams of the solution and adding thymol. This final solution is filtered three times or more and with a crystal of thymol will keep good in a refrigerator for an unknown time. Each dram of the solution represents the products from half a dram of the dried gland. The process for the production of an ounce of the extract takes about six hours. Distilled water should be used and the solutions kept cool during manipulation.

This solution I have given by mouth and by hypodermic in doses up to one dram. Hypodermically it shows no tendency to cause local irritation.

As this is merely a preliminary paper it is not my desire at this time to give my theory as to the cause of cancer nor why I consider the thymus gland should be supposed to be effective in the treatment of cancer. The theoretical side of the question and my experimental work will be given in a future paper.

I would keep to the practical side and may say that I have found the use of the thymus gland in cancer will produce the following results:

- 1 Diminish or eliminate pain
- 2 Diminish the size of the growth
- 3 Its use is followed by better digestion by more regular action of the bowels and improvement of the general condition as evidenced by a clearer skin and eyes greater energy and a *general sense of health and well being*.

I have some reason to hope that the use of the thymus gland will have a wider range of action than in the treatment of cancer and will include sarcoma and some other new

growths, and some diseases due to faulty metabolism or senility

The only use of the thymus gland in the treatment of disease of which I can find any record is, its use first by Mikulicz with some success in the treatment of goitre

Too much care cannot be used in the selection of the thymus glands, and in the preparation of the powder and extract, at a later date I will give further particulars on this subject

The dosage is still experimental and a great deal of care must be exercised in its administration, for I have reason to believe that it is a very powerful agent I would advise the greatest caution in its use and at present can only give general directions to that end

It would seem that the amount of action and reaction depends on the amount of diseased tissue and its situation

I have taken as large doses for as long a time as I have ever given them, with nothing but good results This might represent the non-cancerous or slightly cancerous type

In the case shown, the diseased tissues were in quantity and without ulceration, and all elimination was of necessity through the emunctories The dose in such a case should be small and the patient carefully watched It is possible that once the disintegration is started, it may get beyond our control and I can imagine a case with such an amount of cancerous tissue to be eliminated, that under treatment an auto-intoxication of such severity might ensue as to prove fatal

I think it necessary to utter this warning because in the two fatal cases, Hotchkiss's and Tilton's, with the rapid reduction of the tumor coincided a rapid loss of strength and an early death which suggested a suddenly increased toxæmia

Cases of surface cancer and especially those which are ulcerating seem to stand more medication with greater safety

It is very necessary that, during treatment, every help be given towards elimination The bowels kept slightly loose by phosphate of soda, the kidneys active by plenty of fluids, and the skin active by frequent baths

I would still advise operation in all operable cases. Also in so-called inoperable cases for the removal of as much diseased tissue as possible so that there will be a minimum amount to be absorbed and eliminated. Such a course will not only be safer but will I think shorten treatment and give greater chance of success.

I think it will be found that the rapidity of cure will be in direct proportion to the rapidity of development. Skin cancer and others of slow growth will be slow of cure. The more rapidly growing cancers will be more rapidly cured but with correspondingly greater reactions and dangers during treatment.

I think the treatment offers much to those with small cancers to those with moderate amount of cancer who absolutely refuse operation and to many of those with cancers classed at present as inoperable and incurable and which have not been helped by other means. Every case treated so far has been considered as beyond operation and beyond hope of cure.

It is right that I should be somewhat enthusiastic regarding this method of treatment but I would urge the importance of slow judgment as to its merits and only ask that it be tried and that it be not condemned because it fails to cure every case and particularly those cases in which the disease is very extensive and the vitality very low such cases in short as are likely to be the majority of those first offered for treatment because of the impracticability of subjecting them to operation.

I anticipate that many cases will show improvement but eventually die but with increased experience with the treatment we can I think prognose with some degree of certainty.

No fee has been charged the patients treated and they have understood that the result of treatment was problematic.

As the preparations are not yet on the market<sup>1</sup> and the

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<sup>1</sup>Upon inquiry I find that there are two firms who have had preparations of the thymus gland in the market for some time. I have not tried these preparations.



work is still experimental, I would be glad, within the limits of my time, purse, and facilities, to receive and treat any cases which members of this society are good enough to send me, the proviso being that the patients accept the treatment and its results and report back to those sending them, at stated intervals

NOTE—Since the above paper was read before the New York Surgical Society, criticisms have been made that its publication would be premature, that it would be inferred that I presented a case as cured by thymus treatment, and that I presented the treatment as a positive cure for cancer

If the paper is read carefully I think it will be found to contain no such claims I do not claim to have cured a case as yet, nor do I as yet know that the thymus treatment will cure cancer

The paper is a preliminary report of my work with the thymus gland, it gives the actual results so far obtained, and I consider my presentation of it warranted My object is to bring the subject to notice and to offer it as an invitation to further investigation by clinicians and laboratory workers

# PERITONEAL TUBERCULOSIS \*

BY PARKER SYMS M D

OF NEW YORK

S g t Leba d t Syd h m H p tal

IN 1889 I discovered accidentally that simple laparotomy might effect a cure in cases of tubercular peritonitis I had a patient who presented an obscure abdominal condition and for purposes of diagnosis an exploratory laparotomy was performed On opening the abdomen it was discovered that the patient suffered from tubercular peritonitis principally involving the mesentery and the mesenteric glands One gland was removed for microscopic examination and the abdomen was closed without further surgical interference The case was regarded as hopeless but from the time of operation the patient made a progressive and rapid improvement and became apparently completely well He remained so for about two years when the disease started afresh

In a paper entitled The Influence of Laparotomy on Tuberculosis of the Peritoneum <sup>1</sup> read before the New York Surgical Society in November 1890 this case was reported and I also reviewed all the preceding literature on the subject and set forth the various theories concerning this remarkable phenomenon At that time there was no theory which seemed to explain the fact that laparotomy does effect a cure in a large percentage of cases Up to that time there had been many cases recorded but with few exceptions the operations had never been done for the purpose of affecting a cure of tubercular peritonitis but they had been performed for the purpose of diagnosis or else under the mistaken idea that the surgeon was operating upon some other condition

In 1890 Koenig had tabulated a set of 131 operations in

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\* Read before the New York Surgical Society March 13 1907

this condition<sup>2</sup> and to Koenig belongs the credit of first advocating simple laparotomy as the proper surgical procedure in these cases. My paper, read in 1890, embraced the following conclusions

- 1 That the danger of the operation is very slight, at present the death rate is but 3 per cent

- 2 That sepsis is not so likely to occur in these peritonæa as in laparotomy in healthy ones, on account of the pathological changes which have taken place in the membranes

- 3 That tubercular infection of the wound does not occur

- 4 That disinfections are useless and that drainage should not be used, as it is likely to result in a permanent sinus

- 5 That in unsuccessful cases the operation at best does no harm. Most of the patients who have died at a time remote from the operation, have succumbed to general tuberculosis or to tuberculosis of some other organ

- 6 That established, not advanced pulmonary tuberculosis, is an indication for and not against the operation, for the improvement gained enables the patient to better resist the phthisis, and if this latter is but incipient, recovery may take place

- 7 That laparotomy is the proper form of treatment for these cases. In some unknown way it exerts a most beneficial influence upon the disease, resulting in cure in a large proportion of cases and in a marked improvement in nearly all

Nine years later, I carefully reviewed the subject and found that an immense amount of work had been done in this line, surgeons having eagerly taken up the procedure, but, notwithstanding the mass of clinical reports, practically nothing new had been added. There was still no satisfactory explanation of the phenomenon and nothing new of importance had been proposed in the way of treatment. Laparotomy was considered as the curative procedure by most surgeons and clinicians and as the preferable mode of treatment, but by the end of that decade a reaction set in, many becoming antagonistic to the surgical treatment of this malady, some claiming that more patients would get well under medical treatment than

after operation. Some went so far as to claim that laparotomy is never indicated in cases of tubercular peritonitis. One of the most notable publications in favor of the medical treatment and antagonistic to the surgical was that of Borchgrewink<sup>3</sup> in 1891.

In the same year Fenger<sup>4</sup> wrote a review of the subject quoting from Teleky<sup>5</sup> Frank<sup>6</sup> Bottomley<sup>7</sup> and Borchgrewink<sup>8</sup>.

Fenger gave the views of the advocates and opponents of laparotomy and endeavored to reach some definite conclusions based upon a study of the literature and personal experience. His views seemed to accord with those of Borchgrewink whom he quoted as follows: That laparotomy is well tolerated in strong patients in whom fever is absent and their condition of nutrition good speaks for a spontaneous disappearance of the tubercular process. Laparotomy however in patients with fever when the tuberculosis has a progressive character must diminish what slight power of resistance such a patient has remaining. This power of resistance may thus yield and death follow or it may by concurrence of fortunate circumstances rebound and the patient recover in spite of the operation. That form of peritoneal tuberculosis which exists without fever or with only slight fever runs in itself a favorable course. In such cases laparotomy is unnecessary. In progressive tuberculosis the operation is dangerous and should be abandoned.

Borchgrewink based his conclusions on a study of 40 cases. Of 22 operative cases 8 were light 6 moderately severe and 8 severe. Fourteen or 63.6 per cent recovered and 8 or 36.4 per cent died. Of 17 patients treated without operation 14 or 82 per cent recovered and remained well for two or three years.

The publications of Borchgrewink and Fenger excited renewed interest in this subject and there were many important contributions resulting therefrom. The opinions and conclusions arrived at vary so much that there is an unfortunate lack of unanimity and it is the object of this paper to place in review numerous contributions on the subject and to attempt

to formulate a consensus of opinion which may be a guide to the proper treatment of tubercular peritonitis

Elestratov<sup>9</sup> reviewed the statistics of a number of writers and found that 31·6 per cent of 136 cases recovered under medical treatment and that 78·3 per cent of 240 cases recovered after operation. He judged that the tubercular peritonitis which runs a stationary or chronic course, with little fever and with little or no ascites and but slight disturbance of nutrition, is capable of spontaneous and permanent recovery. On the other hand, when the original tubercular foci can be demonstrated in the mesenteric glands, intestines, or uterine appendages, he thinks that surgical intervention is urgently called for.

Shattuck<sup>10</sup> analyzed the histories of 98 cases of tubercular peritonitis treated in the medical and surgical wards of Massachusetts Hospital from 1889 to 1900. Of 46 cases treated without operation, 7 died in the hospital, while of 52 surgical cases, 6 died in the hospital. The mortality at the time of discharge from the hospital was 13·2 per cent, while the mortality of the same series of cases, after a lapse of from two to eleven years, was 47·3 per cent. The ultimate mortality under medical treatment was 68 per cent and under surgical treatment 37·5 per cent.

The therapeutic lessons derived from this analysis are as follows

- 1 Tubercular peritonitis may be followed by apparently complete recovery, even if complicated by tuberculosis elsewhere, either under (a) purely medical treatment, (b) tapping, (c) incision

- 2 As in other forms of internal tuberculosis, the best obtainable hygienic surroundings are all-important, consequently no patient should be kept in the hospital longer than is necessary, especially if more and better air can be secured outside, with proper care and food

- 3 We are warranted in trying medical treatment for a time, especially under first-rate hygienic conditions, tapping the abdomen if there is sufficient fluid to cause discomfort

- 4 If the patient under a month or six weeks of medical

treatment fails to improve or in even less time if he seems to be losing ground surgical treatment should be advised

Miles F Porter<sup>11</sup> presented a paper on the study of the literature of the subject and a personal experience in the operative treatment of 12 cases. He does not ascribe recoveries to the operation alone but believes the operation to have a decided curative effect. In his opinion the ascitic form yields the best results and the ulcerating or caseating the worst. Porter suggests the exposure of the open peritoneal cavity to the actinic and X rays.

Veit<sup>1</sup> reviewed the literature and expressed the view that tubercular peritonitis may get well spontaneously even if not very frequently. He ascribes failure after operation in many instances to tuberculosis of other organs. He advises laparotomy without drainage in acute cases as soon as difficulties arise and in chronic cases in which spontaneous recovery does not take place after a reasonable observation.

Thoenes<sup>13</sup> reported 33 operative cases from Kummel's clinic. Of 16 cases with ascites 3 died or 18.7 per cent 10 were discharged cured. (Three of these 10 were later operated upon for some other condition four eight and eleven years after the original laparotomy when no trace of tuberculosis was found.) Of the 3 cases remaining in the hospital 2 recovered subsequently. Of 17 cases of the dry variety 12 or 70.6 per cent died 3 were cured and 2 improved. The ascitic variety shows the best results laparotomy in the dry variety proved disastrous.

In a later article<sup>14</sup> Thoenes analyzed 80 cases from the Eppendorf Hospital and the surgical clinic of Gottingen. These cases were followed for some time after they left the hospital. His investigations established the fact that while a number of cases will recover under medical treatment or without any treatment at all there are many in which internal medication fails and subsequent laparotomy proves of decided value. He regards advanced complications of the lungs larynx and intestines as well as septic conditions contraindications to operation. He believes that procedures such as the removal

of primary foci are only permissible when they can be done without the breaking up of dense adhesions. He compared the medical and surgical results in a collection of cases and found 48 per cent of lasting cures in 82 cases treated medically, and 54 per cent of lasting cures in 244 cases treated surgically. This would indicate that the results after medical treatment are not so good as those after operation and that one should resort to laparotomy without continuing medical treatment more than a few weeks, unless there should be marked benefit shown.

Schwarz<sup>15</sup> reported 30 cases treated by laparotomy, of which 21, or 70 per cent, were cured. One case was well ten years after operation, 4 seven years after, 4 five years, and 7 three years after. None of the fatal cases died as the result of operation. In 4 cases he was able to demonstrate a cure at subsequent operations for some other conditions.

Dœrfler<sup>16</sup> reported 32 cases. He employs conservative treatment as long as the amount of exudate does not threaten life, as long as there is but slight fever and as long as the general condition remains fair. He operates if there be hectic fever, if ascites increases, or if the patient is losing strength. He advises early operation in acute cases, associated with high or persistent fever. He tries aspiration first, if that fails, he performs laparotomy. He is in favor of drainage after laparotomy. He considers the ulcerating form hopeless.

Friedlander<sup>17</sup> cannot believe that so serious and chronic a process as tuberculosis can be influenced by so short an intervention as laparotomy. He used statistics to prove that laparotomy favors the occurrence of fæcal fistulæ. He cautions against breaking up of adhesions, but advocates laparotomy in the presence of palpable undulating masses and uncysted collections of pus and stagnating secretions.

Fairchild<sup>18</sup> advises laparotomy where an intra-abdominal focus is suspected or diagnosticated. In the ascitic variety, he recommends laparotomy if the hygienic treatment has failed. In the fibrous form, he advocates the same. He considers laparotomy useless in the acute form with ascites and

high fever Where there is much matting together of the intestines he thinks laparotomy will be unsuccessful

Guthrie<sup>19</sup> reported 41 cases Fourteen were operated on with 7 deaths 27 were treated medicinally with only 4 deaths He recommends tapping in chronic cases with ascites He believes laparotomy beneficial only because it does away with the fluid

Pagenstecher<sup>9</sup> advocates operation in the chronic stage and in those cases in which the uterine adnexa are the primary foci He does not believe in operation in the dry variety and in the encapsulated form of the disease

Rotch<sup>1</sup> wrote a very important article with an analytical study of the cases which had occurred in the Children's and Infants Hospital of Boston Mass during the eighteen years preceding Rotch is in favor of operation He feels that operation should not be done during the first year of infancy because then tubercular peritonitis is usually a part of a general miliary tuberculosis He feels that the ascites shows a less advanced form and a more active process which is favorable from a prognostic standpoint He considers the fibrous form less favorable especially if ascites is absent In the ulcerative caseous form it is usually found that there is tuberculosis elsewhere especially in the bronchial lymph glands and lungs which acts as the primary focus of infection hence these cases are not benefited by laparotomy He would advise laparotomy in the primary form even if the peritonitis is secondary to a mesenteric gland which should be removed

The following passages are well worthy of quotation

There have of course been cases of tubercular peritonitis which have recovered spontaneously but the fact that this result can occur does not indicate as has been suggested by some writers that we should not operate but should wait and see whether such spontaneous recovery would take place

The danger of localized tubercular peritonitis which we know can get well becoming disseminated and thus producing a general tuberculosis or a localized tuberculosis of the lung or brain is undoubtedly a great one and knowing that



if this dissemination does take place the child will in all probability die, it seems much more reasonable to operate before such dissemination has taken place, than to wait until it is too late. It is also well known that, first, in individual cases of localized tuberculosis, we are unable to say whether such cases will recover spontaneously or will become a general tuberculosis, and second, that an exploratory laparotomy, when performed by an expert, is known to be of little danger, especially in the earlier stages of the disease, when the child has not yet become markedly reduced in strength and vitality. Is it not better, then, to give the child the benefit of the chance, and when we are reasonably sure that tubercular peritonitis is present in a child over one year of age, and when there are no evident signs of tuberculosis elsewhere, or possibly only in the mesenteric lymph-nodes, is it not better to make an exploratory laparotomy at once?"

Zesas<sup>22</sup> reviewed a long list of articles on the subject and reported two surgical cases of his own. He does not believe in waiting for spontaneous recovery, with all its uncertainties.

Ochsner<sup>23</sup> advocates drainage for laparotomy in the ascitic form. He cautions against breaking up adhesions and against rough manipulation of the tissues, particularly of the intestines. In the absence of the ascites, the diseased tissues may be removed, if the section is made through healthy tissue. He tabulated 32 cases treated in one hospital and later he recorded 8 more cases. From his experience, he drew the following conclusions:

- 1 In the absence of fluid, the diseased tissues can be removed with safety if the section is made in healthy tissues.
- 2 In the presence of ascites, remove it thoroughly and drain.
- 3 Avoid injuries of the peritoneum (abrasions).
- 4 Adhesions should not be disturbed.
- 5 The more gentle the handling of tissue, the better the results.
- 6 The diseased pelvic organs tolerate handling better than the intestines.

Eichberg <sup>4</sup> claims the percentage of recoveries for all ages without operation to be greater than with operation. He recognized the fact that cases with ascites form an exception but he holds that these are cases which tend to spontaneous cure. In the discussion which followed so eminent a clinician as Tyson of Philadelphia said: To treat it medically is to temporize in other words that there is but one treatment that is likely to lead to satisfactory results and that is surgical.

Halstead of Chicago <sup>5</sup> advocated laparotomy in a majority of cases. Most of the cases cured by laparotomy he claims to be of the acute miliary form.

Koppen <sup>6, 7</sup> believes in operation when the exudate becomes troublesome and the general condition does not radically improve. He advises removal of the exudate by laparotomy and washing out the abdomen with a saline solution.

H. W. Freund <sup>8</sup> believes in conservative treatment for mild cases but in surgical treatment for severe cases. He argued against the skepticism of Borchgrewink which he said experience has contradicted.

Schraum <sup>9</sup> reported 45 cases in children. The operated cases showed the best result. He considers the prognosis best in the exudate form.

Murphy <sup>10</sup> in his classic article described four varieties of tubercular peritonitis: 1 c

1 Disseminated exudative miliary non confluent serous (ascitic) variety

2 Nodular ulcerative or perforative (the least frequent variety)

3 Adhesive fibroplastic cystic partition or obliterative variety

4 Suppurative circumscribed or general mixed infection

He recognizes four essential features in the treatment of peritoneal tuberculosis. First to remove or shut off the source of supply of new tubercular debris second to remove the products of the infective process from the peritoneum third to increase the tissue proliferation for the encapsulation of the foci already present fourth to avoid mixed infection. He

says that all treatments which have availed have succeeded on these lines

Murphy believes surgery to be a benefit in the disseminated serous, and in the nodular, ulcerating varieties, but in the adhesive variety, surgery is of little avail

He lays special stress on the necessity of removing or shutting off from communication the original focus of the disease, as the fallopian tubes, vermiform appendix, etc

McMurtry<sup>31 32</sup> thinks in those cases of marked acuteness, characterized by high temperature and rapid pulse, both with and without effusion, operation generally fails to arrest the active progress of the disease. Nevertheless, the hopeless character under any other form of treatment and the harmlessness of method under aseptic precautions, justifies, he believes, the operation in every case, especially if there is effusion and diagnosis is not absolutely positive. Thorough removal of the invaded structures is usually followed by permanent cure.

L. Miserochi<sup>33</sup> reported 14 cases cured by medical treatment alone. He had more cases, but mentioned only those in which the interval had been long enough to speak of a permanent cure. In 8 of his cases there was ascites. By the use of iodine internally and externally the ascites was absorbed and the palpated nodules retrogressed.

Charles H. Mayo,<sup>34</sup> and abstract,<sup>35</sup> removes the original lesion, leaving the peritoneal condition to cure itself. He closes the abdomen without drainage. He believes cases should be selected, in some patients the condition is such as to render operation extremely hazardous, as well as futile. In males the incision is made over the vermiform appendix, in women it is so arranged as to explore the pelvis. He reported 59 operations by the older method,—*i e*, without removing the original focus. Of these there were 42 cured, 15 improved, and 2 died. Of 58 operations for removal of tubercular tubes, there were 56 recoveries and 2 deaths. Of 27 cases of tubercular appendicitis (appendectomies) there was no death.

Schomann<sup>36</sup> formerly did laparotomy in selected cases. Now he believes he gets better results by puncture and injection.

of 5 per cent glycerine emulsion of iodoform. He treated 7 cases and regarded them all as cured in the course of from three to ten weeks' treatment. Some of the patients required repeated injections.

Wm J Mayo<sup>37</sup> in his article "Surgical Tuberculosis in the Abdominal Cavity with Special Reference to Tubercular Peritonitis" reviewed post mortem statistics viz. In St Mary's Hospital Rochester Minn. from October 1, 1894 to October 1, 1904 a period of ten years there had been 6,408 abdominal operations performed. Of this number 5,687 were intraperitoneal and 184 or about 3 per cent were for some variety of tuberculosis. Localized intestinal tuberculosis occurred 21 times, 13 cases were primary and 8 were uncertain.

He discussed the various forms of intestinal tuberculosis.

Tuberculous disease of the appendix we have found as a localized process 29 times with no deaths in 1,888 operations for appendicitis. Tuberculosis was found localized in the Fallopian tubes 44 times without tubercular peritonitis, the tubal lesions being securely walled off.

In other words between the ages of twenty and forty years tubercular peritonitis is certainly very much more frequent in females and so far as direct sources of infection are concerned the tube is the one which may explain the difference in frequency. There were *89 cases of tubercular peritonitis with 3 deaths*.

The clinic of this hospital is drawn largely from a fixed agricultural community and the majority of cases operated on who left the hospital improved but failed to stay well returned for further treatment. A considerable percentage did not maintain the improvement and in the course of years patient after patient would return with relapse of the peritoneal condition or some other form of tuberculous infection. Some returned for further operation as many as four and five times. It became evident that in a considerable percentage of cases there was some source of reinfection of the peritoneum after apparent cure.

" Having under observation a small number of patients in whom simple laparotomy had failed to permanently cure tubercular peritonitis, we began to do a radical operation, performing hysterectomy with removal of ovaries and tubes " He found this to be too radical because the uterus and ovaries showed no disease

" By patience and care, we found it possible to enucleate tuberculous tubes in 26 cases of tuberculosis of the peritoneum In practically all these cases the peritoneal involvement was the greatest in extent near the seat of local infection, this has been generally noted and heretofore ascribed to gravity It is more likely to be due to proximity to the seat of infection "

" In many instances the region of the greatest distribution of tubercular peritoneal nodules could be shown near the appendix " " While simple abdominal incision and drainage has failed to cure all the cases, it did cure many and usually gave relief for a time, and if re-infection could be prevented, the cure might be expected to be permanent in a much larger number "

" Can we prevent relapse? Certainly we can in many instances Of the 26 radical tubal operations we have made on cases of tuberculous peritonitis, 25 recovered, of these, 7 had been operated on by simple laparotomy from one to four times previously In not a single patient as yet has another operation become necessary, and, as contrasted clinically with a preceding group of equal number, the favorable results are most striking "

" In tubercular peritonitis in women, we evacuate the fluid and then place the patient in the Trendelenberg position, packing off the general abdominal cavity in the usual manner The pelvic organs, appendix and cæcum are examined If the Fallopian tubes, appendix and cæcum are diseased they are removed " No drainage In men, the incision is placed to the right of the median line over the appendix "

" The treatment of tubercular peritonitis should embrace not only the treatment of the peritonitis which is symptomatic, but the removal of the source of infection which, in the majority

of cases will be found in the Gallipian tubes appendix or intestine

Goschel<sup>38</sup> in his experience found that about 23 per cent of ascitic cases and only 10 per cent of cases of adhesions were cured by operation that children recovered spontaneously in about one-third of the milder uncomplicated cases He advises that laparotomy always helps sometimes cures and never harms

F F Lawrence<sup>39</sup> advocates operation he believes in drainage and thinks that the primary focus should be removed

S Lloyd<sup>40</sup> reported 21 cases His experience and opinion formed from literature makes him feel that operation gives the best chance to the patient

G Faludi<sup>41</sup> believes in laparotomy in the ulcero-caseous and fibro-adhesive varieties in children and in the ascitic form after hygienic and dietetic treatment have been tried without success or in cases where it cannot be tried he believes the serious tubercular affection of other organs to be a contra indication

D McCartney<sup>4</sup> advocates laparotomy In cases of doubt he insists on exploratory operation

T Guthrie<sup>43</sup> believes in laparotomy In the ascitic form he thinks aspiration may be of value in some cases In the caseous and ulcerative form operation is contraindicated and frequently in the adhesive form

John B Boucher<sup>44</sup> considered the etiology pathology diagnosis and treatment of the disease and quoted Murphy as follows

The surgical treatment of tuberculosis of the peritoneum involves the following propositions 1 To remove or shut off the source of supply to the peritoneum of new tuberculous debris 2 To remove the products of the infective process from the peritoneum 3 To increase the tissue proliferation for the encapsulation of the foci already present 4 And to avoid mixed infection Serous variety gives the best results Dry and ulcerative variety is followed by high mortality and little is accomplished by surgery In the localized suppurative

form, the operative result is quite favorable, while in the suppurative multilocular cystic variety but few recover."

The literature reviewed above practically embraces the reports of all the work which has been done in this field of medicine during the period of modern surgery. There has been a vast amount of clinical work and scientific research, but some phases of the question stand exactly as they did when I wrote my first paper on this subject in 1889. To-day it is as true as ever that laparotomy *per se* will affect a cure in certain cases of tubercular peritonitis, that is to say, this cure is brought about by merely opening and closing the abdominal wall, and to-day we are as ignorant of the reason why this remarkable phenomenon takes place as we were when it was first discovered and demonstrated. On the other hand, much has been learned in the last ten years of the rationale of the treatment of tubercular peritonitis. For instance, we have learned that operations should not be undertaken during the first year of infancy, we have learned that surgery offers but little hope in the adhesive variety of the disease, we have learned that the serous variety offers the best prognosis under the various forms of treatment and that the surgical treatment of this variety offers the best results obtainable in this disease, but the most important lesson we have learned is that the scientific operation of to-day is the one which has for its foundation the removal of the original focus of the disease, as tubercular Fallopian tubes, vermiform appendix, mesenteric gland, etc. Perhaps William Mayo has made this clearer than any of the contributors to this subject when he detailed a number of cases in which repeated operations had been done under the older method, recurrence taking place and finally laparotomies had been performed, with removal of the original foci, and the patients have remained well.

The skepticism toward the surgical treatment of this disease, as particularly championed by Borchgrewink, has not prevailed. Statistics have proved that cases treated by operation have done better than similar series of cases treated without operation. On the other hand, much has been added to our

knowledge of the disease by the writings and thoughts of these men. We realize the importance of hygienic treatment; we realize the impropriety of operating on all cases of tubercular peritonitis; we realize that laparotomy should not be performed when the peritoneal trouble is only one phase of a more or less general tuberculosis.

Before closing I wish to thank my colleague Dr. Henry Roth for he rendered me the greatest assistance in compiling and analyzing the voluminous literature on this subject.

If the next few years shall add as much to our knowledge of this subject as was learned during the last decade it will certainly be a great blessing to humanity for we may look forward to a constant improvement in the results of treatment in this serious malady.

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# ACUTE DIFFUSE GONORRHOEAL PERITONITIS \*

BY CHARLES GOODMAN M D

OF NEW YORK.

Ad; ct Att d g S g t B th I ra l H p tal Adj ct Att d g S g t M t  
f H m Ch f S gical D p tm t Mt S nai Hospital D pensary

SINCE the discovery of the gonococcus by Neisser in 1879 and its isolation by Bumm in 1885 it has become known as one of the most important of the pathogenic bacteria. From Cushing I quote the following: "Few organisms not even the bacillus typhosus rival it in the number of suppurative sequelæ which may follow a primary infection. Its occurrence in the conjunctivæ and in the iris, the bones<sup>1</sup> the joints, bursæ and tendon sheaths, its occasional demonstration as the cause of endocarditis and pericarditis, pleuritis and phlebitis and the recent observations from the blood show that its possibilities for metastatic complications are as numerous as are those arising from the spread of infection by direct continuity of surfaces."

In 1886 Saenger reported two cases of puerperal peritonitis which on account of the striking clinical evidence may be regarded as those of gonococcal origin. His cases cited were two multipara infected with gonorrhœa by their husbands—one nine and the other twenty one days after delivery.

In the discussion which followed the report of the cases in the absence of bacteriological proof Bumm was inclined to doubt the gonorrhœal cause of the peritoneal inflammation and asserted that the gonococcus could live only in the superficial layers of mucous membrane. As a proof of his assertion he stated that he had many times attempted to produce suppuration by injecting subcutaneously cultures of gonococci but had as yet failed in every instance to produce an abscess.

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Read before the Metropolitan Medical Society Feb 26 1907

Cupler R C Gonorrhœal Ote my litis ANNALS OF SURGERY  
Janu ry 1907

Kaltenbach was inclined to disagree with Bumm, and mentioned the formation of the urethral stricture as a reasonable proof that the gonococcus extended its exploits deeper than the mucous membrane

During that year and the two following years, cases of peritonitis of gonorrhœal origin were reported by Loven, Hatfield, Huber, Penrose and Stevens. All these occurred in children infected with gonorrhœal vulvo-vaginitis, and are not conclusive owing to the lack of demonstrating the gonococcus in the peritoneal cavity

More convincing, however, is the case reported by E Ceppi,—that of a woman twenty-nine years of age, who had previously been healthy, with the exception of having had a vaginal discharge for one year. She was suddenly taken sick with chills, fever, abdominal tenderness and distention, and was vomiting bile. Laparotomy was performed, and several abscesses were opened. These and the cervical canal showed presence of the gonococcus

In 1891, at the meeting of the German Gynæcological Society in Bonn, Bumm emphasized his views more than ever and vehemently denied the possibility of the gonococcus existing in any other tissue excepting the mucous membrane

At this same meeting, Wertheim presented his report of interesting, painstaking and conclusive experiments undertaken and conducted by himself, the results of which proved conclusively that the gonococcus alone, without the presence of other pyogenic bacteria, could produce suppuration in a serious cavity like the peritoneum

He had injected gonococci with their culture media into the peritoneum of mice, rats, guinea pigs, rabbits and dogs, and produced purulent peritonitis which would reach its acme in about three days. All the animals experimented upon recovered, and he demonstrated the presence of the gonococci in the peritoneum, in the lymphatics and in the superficial muscular layers and their sheaths

Wertheim noted that the peritonitis produced by the gonococcus was accompanied by an appreciable greater exudate than

that produced by other organisms and concluded that in view of the susceptibility that the human being has for gonorrhœa *and in view of the results of his experiments on animals less susceptible to this infection* he had proven indubitably the possibility of its existence in the human being

A few months later he was able to further substantiate his conclusions by a female patient age twenty five whom he was called to operate upon. The patient was a nullipara and was suffering with pelvic pains and a leucorrhœa for three years. She was admitted for operation with symptoms of acute peritonitis. Laparotomy revealed pus discharging from the right tube. Cultures taken from peritoneal exudate showed gonococci.

The original assertions of Bumm were now proven as untenable.

Subsequently several cases are found to be reported in the literature of this subject. That gonorrhœal peritonitis can exist in the male is shown by cases reported by Challan, Mermet, McCosh, Van Zeisel, Horwitz and Jadahnsson.

In 1895 L. Frank published what might be considered the first case of gonococcal peritonitis with bacteriological proof as such published in this country. He had operated upon a prostitute seventeen years of age for acute pyosalpinx. During the operation the right tube had ruptured and soiled the peritoneum. In spite of the employment of irrigation and drainage she developed a septic peritonitis within twenty four hours and died two days later. Cultures taken from the peritoneal cavity during the autopsy showed only gonococci.

Of the cases reported none are fortified by more convincing bacteriological proof than two cases reported by Harvey W. Cushing in 1899. He had operated upon two females respectively twenty five and eighteen years of age at the Johns Hopkins Hospital for peritonitis and in the first obtained smears from the peritoneal exudate showing gonococci and from the second he also obtained gonococci in pure culture.

The writer should like to narrate here the report of a similar case operated upon by him in August 1906.

R J, age seven and a half years, school girl, was admitted to Beth Israel Hospital August 22, with history as follows

Previous history negative

*Present History*—One week ago mother noticed that child was chafed about the genitals and that she had a vaginal discharge. The family physician, Dr J Rosenblueth, was consulted, and he, after instructing the mother how to prevent infection of the other children in the family, prescribed douches of a weak permanganate solution. Three days later the child suddenly became feverish and complained of being ill. Her temperature was  $102\frac{1}{2}$ , pulse 140. She complained of no pain, and there was no abdominal tenderness. An enema was administered and was followed by a movement. The douches were now discontinued. Twelve hours later vomiting set in. The temperature and pulse remained about the same, the tongue was coated, and she complained of pain in the epigastrium. There was absence of tenderness and rigidity.

Three doses of calomel,  $\frac{1}{8}$  grain each, were followed by vomiting. The following morning the child had several loose passages and had some pain in the left iliac region. Vomiting still persisting. The following, or the fourth day of illness, she felt better, and attempted to get up and about. At midnight vomiting set in again. Enemata were again administered but were not retained. The abdomen became distended and very hard. With increasing severity of the symptoms and the abdominal tenderness of the left side more marked, her condition became alarming and the following morning she was sent to the hospital. About this time it was noticed that the vaginal discharge had diminished.

*Examination upon Admission*—General appearance is that of a very sick anæmic little girl. Temperature  $100.6$ , respiration 34 and thoracic in character, pulse 130. Abdomen uniformly distended and tympanitic, but the rigidity of the recti was not marked. General abdominal tenderness more marked in umbilical and splenic regions. No tumor could be made out nor increase in tenderness in the right iliac region.

There was a clear picture of general peritonitis, and it did not appear to me as one of appendicitis nor intussusception. An examination of the vulva revealed a purulent discharge which was immediately examined and found to contain gonococci.

*Blood Examination*—Leukocytosis 12 800 polynuclear 62 per cent (small mononuclear 19 per cent large mononuclear 2 per cent) transitional 1 per cent and eosinophiles 16 per cent

*Diagnosis*—General peritonitis probably gonorrhoeal in origin

*Operation*—Ether drop method on open Esmark inhaler Abdomen opened through Kammerer incision  $2\frac{1}{4}$  inches in length over right rectus Upon opening the peritoneal cavity some seropurulent fluid escaped The intestines appeared very much distended and injected The appendix was slightly injected but otherwise appeared normal and not adherent Several collections of purulent fluid were found between the intestines one of which was located near the splenic region

The pelvis contained a large abscess and the tubes felt thickened but owing to the extreme distention of the intestines could not be exposed On several coils were deposits of lymph Cultures and smears were taken by Dr I Strauss pathologist of the hospital Much of the fluid contents of the peritoneal cavity was mopped up with sterile dry sponges The appendix was removed

A small cigarette drain was inserted to the stump of the appendix and another into the pelvis and the remainder of the wound sutured The bowels were moved at end of twenty four hours after which vomiting ceased In addition to stimulation she was given two injections of Torrey's anti gonococcus serum obtained through the kindness of Dr Strauss There was nothing noted after the injection of the serum which might have any bearing upon the course of the disease The temperature was normal at end of the first week all drainage was discontinued on the tenth day

September 4 patient was discharged feeling perfectly well and the wound entirely healed The vaginal discharge still showed the presence of gonococci four weeks after leaving the hospital

*Bacteriological report* by Dr I Strauss pathologist of the hospital Patient R J operated upon August 2 1906 Spreads of vaginal discharge showed numerous pus cells many intracellular Gram negative diplococci or gonococci Fibrin and exudate from peritoneum numerous gonococci in masses of fibrin No

pus cells, other bacteria absent    Cultures from peritoneum gave gonococci in pure culture on serum agar and serum sugar agar  
Cultures from vaginal discharge contain gonococci    Appendix normal

The case was therefore definitely an instance where the diffuse peritonitis was due to gonococcal infection alone, and a review of the literature of the subject (including 74 cases reported) present several points of interest for consideration

*Etiology*—Gonorrhœal peritonitis can exist in the male, but judging from the very few cases reported must be uncommon, and is caused by the infection extending along the lymphatics of the cord to the peritoneum    One such case with positive bacteriological findings at autopsy was reported by Challan in 1893

In the female it may be a complication of an *acute* gonorrhœal vulvo-vaginitis, and, as pointed out and demonstrated by Veith, Cumston and others, gonorrhœa may be the sole cause of peritonitis arising during the second or third week of the puerperium    The infection is conveyed to the peritoneum either through the lymphatic system, or, as more commonly demonstrated by cases operated, the peritonitis is due to the emptying of the gonorrhœal pus direct into the general cavity through the patent ostia abdominalis

Gonorrhœal peritonitis may also be produced by direct infection during removal of an acute pyosalpinx, an instance of which is the case of Frank's, already narrated in this paper    That diffuse gonococcal peritonitis is not more common may be accounted for by the gummy or adhesive character of the exudate, which causes adhesions and confines the infection to the pelvic peritoneum or to the tube itself by sealing the fimbriated extremity

With a view of ascertaining the dangers which might follow the rupture of a pyosalpinx, several investigators undertook to examine bacteriologically a number of tubes removed surgically

Menge in 1891 reported results of his examination in 26

cases of purulent salpingitis and found bacteria in 8 of these 3 of which contained gonococci. All three gonorrhœal tubes had ruptured during the operation and their contents caused a soiling of the peritoneum. One of these patients died and post mortem one and one half hours later showed streptococci in the peritoneal cavity.

Andrews in 1904 (cited by Dudgeon and Sargent) published the results of bacteriological examination of the interior of the tube in 684 collected cases of pyosalpinx. The diagnosis in most instances was based upon microscopy only—some upon both films and cultures—and a few upon animal experiments. The result showed 55 per cent to be sterile, 22.5 per cent to contain the gonococcus, 6 per cent saprophytes only and the rest a variety of pyogenic organisms. These figures being based largely upon very incomplete bacteriological examinations must be received with a good deal of reserve but they go to show what a small proportion of cases of pyosalpinx constitute any grave danger to the peritoneum.

*Symptomatology*—Several observers notably Saenger, Charrier, Rousseau, Comby, Northrup and others attempted to describe characteristic diagnostic features of diffuse gonorrhœal peritonitis and the abrupt or explosive onset with very serious aspect is mentioned by Comby and Northrup as characteristic of this malady.

A careful perusal of the histories of the cases so far reported show that the symptoms do not differ materially from those elicited in peritonitis from other causes.

Ruptured appendicitis has in several instances been mistakenly diagnosticated. Nor is it always possible to differentiate clinically an acute pelvic from an acute diffuse peritonitis of gonorrhœal origin.

*Prognosis and treatment* have occasioned much discussion owing to the view taken by some of the observers particularly the French writers who are inclined to take a very favorable view as to the outcome.

That gonorrhœal peritonitis is capable of producing a fatal septicæmia is proven by cases reported by Frank Meja



V Leyden, Muscatello, Frank and Koehler, Lilienthal (quoted by Welt-Kakels), Koplik, and others

Most writers agree that acute diffuse gonorrhœal peritonitis is particularly fatal in children

In 1896 Broese reported 2 cases of vulvo-vaginitis complicated with symptoms of diffuse peritonitis, in which operation was deferred and both recovered. These and similar cases reported by Comby, Northrup, Sebilleau, Galvagno, Maifan, render the indications for operations questionable

Most of these cases lack, however, the bacteriological proof of their gonorrhœal origin, and some lack the sufficient evidence that they were diffuse, but rather only pelvic peritonitis with severe symptoms

Of the 75 cases collected, including the writer's case, only 30 had the diagnosis fortified by autopsy or bacteriological examination

A detailed review of all the cases is precluded by the brevity of time allotted to me to the reading of the paper—a brief summary only will therefore be presented for your consideration

Of these 30 cases, 14 resulted in death of the patient. There were 20 operated upon with a mortality of 4. Two of the deaths of the operated cases cannot be ascribed to the operation, nor alone to the gonorrhœal peritonitis

One case by Hunner and Harris developed bronchopneumonia after operation, and at the autopsy, while the gonococcus was recovered in the peritoneal cavity, streptococci were found in the blood of the heart, in the lungs, bladder and other organs

Second case is one of Dr Koplik's, cited by Dr Welt-Kakels, a child which had undergone two serious operations for empyema, developed a general peritonitis for which she was operated by Dr Elsberg in the service of Dr Lilienthal at Mt Sinai Hospital. Cultures from the peritoneum proved the peritonitis to be of gonococcal origin

The child was certainly not in a favorable condition, and therefore it is hardly fair to ascribe to the operation a contributory cause of her demise

If we exclude these two cases we have 18 with a mortality of 2—certainly a small one

*Conclusion*—Diffuse gonorrhœal peritonitis is a serious and sometimes fatal malady which when not operated is likely to leave a legacy of pus tubes in the female already doomed to sterility and possibly lasting invalidism

Diffuse gonorrhœal peritonitis may recover with palliative or symptomatic treatment alone but we must continue to operate some of the cases with reasonable assurances of recovery

The number of cases of gonorrhœal peritonitis operated upon will be diminished when we will have the means of making a positive diagnosis as to the bacteriological character of the infection or when a satisfactory antigonococcic serum will be at our disposal

It is hoped however that the discussion occasioned by this report will enable us to bring to light some more clinical data which will help us to outline definitely the course to pursue in cases of suspected acute diffuse gonorrhœal peritonitis

*Conclusions* The gonococcus is capable of producing a local or a diffuse peritonitis without the presence of other pyogenic bacteria

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# SOME PRACTICAL DEDUCTIONS FROM PERSONAL EXPERIENCE IN THE TREATMENT OF APPENDICITIS

BY LEWIS A STIMSON, M D,

OF NEW YORK,

Surgeon to the New York and Hudson Street Hospitals

NOTWITHSTANDING the large and rapidly increasing experience in operating for appendicitis, there seems still to be a wider divergence in the opinions held and the methods practised than can fairly be attributed solely to temperamental differences among those who hold and practise them. And upon at least two points—the wisdom and character of interference in the gravest form of cases and drainage—this divergence is so great that the views held on one side are directly opposed to and condemnatory of those held on the other. As a contribution toward the possible establishment of more uniformity in opinion and practice I have collated my personal hospital statistics for the past four years and beg now to place them before you. The period of four years was chosen because, while brief enough to insure practical uniformity of practice, it is yet, I think, long enough to protect against the usual errors of chance.

The services are those of the New York and the Hudson Street Hospitals. The former covers a total of about sixteen months—four services of about four months each between October, 1903, and February, 1907, and a few intermediate cases. The latter covers my personal work during 1903–1906 about thirty months. To avoid misapprehension I may add that, while the list is wholly operative, yet it excludes no admitted case that died, cases which recovered without operation are not included. The New York Hospital list was made by the Librarian from the card index, and its completeness and accuracy are supported by contemporaneous reports made to

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\* Read before the New York Surgical Society, March 27, 1907

the Board at the end of each term of service. The Hudson Street Hospital list was made by the house surgeon from the bound volumes of case reports for the four years.

The New York Hospital service presumably differs but little if at all from that of any other large city hospital and from private practice mainly in that a somewhat larger proportion of the cases are probably first seen in the later stages of the disease. In the Hudson Street Hospital service this difference is rather more marked for the community which it serves is poorer and less well provided with private medical advice. Of course in a hospital the provision for operating and safe guarding the patient is in some respects better than in private.

A classification of the cases for the purpose of this paper is not easily to be made for the symptoms, the gross pathological changes found at operation and the apparent gravity of the cases do not closely correspond. It has long been the practice in the laboratory of the New York Hospital to subject all appendices removed at operation to a systematic examination and the results of many of these examinations form part of the histories. They show quite uniformly a series of changes of an inflammatory and ultimately ulcerative character starting in the mucosa. Of these the lowest apparently representing recovery from a moderate inflammatory attack is an atrophy of the mucosa with local or general narrowing of the lumen. Next is a round cell infiltration of the mucosa extending more or less through the other coats and reddening or even roughening the surface and sometimes associated with partial necrosis of the mucosa. Then comes a fibrino-purulent exudate in all the coats with partial or complete necrosis of the mucosa and in the later stages ulceration and perforation of the entire wall, the latter apparently taking place with special frequency at points corresponding to enteroliths of various sizes. The perforation may occur promptly on the first day and in one case was absent on the eighth day although pain, tenderness and rigidity had been marked throughout.

The grade of peritoneal reaction does not correspond closely with the condition of the appendix or with the length of

time since the onset of the attack. A general peritonitis, shown by abundant turbid serum throughout the cavity, may be present by the second day and with only a partial necrosis of the mucosa of the appendix and a round-cell infiltration of its wall. In 2 of the 4 cases, of this kind, of the list the appendix was not perforated. And many cases of abscess, walled in or free, and of localized collections of turbid serum coexist with an appendix that shows to the naked eye only hyperæmia of the surface and stiffness and enlargement of more or less of its length, and under the microscope any of the changes from thickening of the mucosa to its necrosis, and from round-cell to fibrino-purulent infiltration of the coats.

I have, therefore, roughly grouped the cases according to the character and extent of the peritoneal reaction. Some of the dividing lines are necessarily arbitrary and somewhat vague, and some of the groups might perhaps as fairly be combined with each other as separated.

Group I is of the cases of general peritonitis. In all there was abundant turbid serum or even thin pus throughout the peritoneal cavity.

Group II includes the cases in which similar exudates were found beyond the immediate neighborhood of the appendix and pelvis, but not everywhere.

In Group III this reaction was limited to that neighborhood and to the hollow of the pelvis.

In Group IV there was an abscess completely walled off, with or without adjacent peritoneal reaction.

Group V is composed of those numerous cases with which all are so familiar—the “acute suppurative,” the “acute gangrenous,” and some of the “acute catarrhal” forms, the appendix is swollen, rigid, congested or perhaps grayish in color,—sometimes free or with few adhesions, sometimes buried amid them or behind the cæcum or colon and then pliable and softened by inflammatory changes.

Group VI includes the milder cases, the subsiding attacks, some of the recurrents, those in which the pain seems to have been due to an obstruction of the lumen of the appen-

dix rather than to an acute inflammation those in short in which the inflammation is but slight

Group VII includes the interval operations

The cases are as follows

| Group                    | New York Hospital | Hudson Street Hospital |
|--------------------------|-------------------|------------------------|
| I General peritonitis    | 3                 | 1                      |
| II Extensive peritonitis | 5                 | 4                      |
| III Local and pelvic     | 9                 | 6                      |
| IV Closed abscess        | 16                | 6                      |
| V Acute pyelitis         | 24                | 11                     |
| VI Subacute appendicitis | 7                 | 3                      |
| VII Interval operations  | 3                 | 0                      |
|                          | —                 | —                      |
| Total                    | 67                | 31                     |
|                          | (No deaths)       | (1 death)              |

All of the New York Hospital cases recovered and all of the Hudson Street Hospital cases except one. The fatal case was in Group II—extensive peritonitis with a perforated appendix. He survived until the eighth day. It is but fair to add that the clean record of the New York Hospital list would have been broken had it not been for my enforced absence on one occasion. The case was an urgent one of extensive peritonitis on the fourth day another surgeon operated. The patient left the table in good condition but died fifteen minutes later with symptoms of pulmonary embolism.

The main principle of the operative treatment has been to do the least that would probably be sufficient to accomplish the object whether that were the arrest of an appendicitis or of a peritonitis. The work is done rapidly the incisions are as small as the conditions permit the intestines handled as little as possible and usually protected with flat sponges (not gauze pads) as soon as the peritoneal cavity has been opened.

In 9 of the 98 cases in which the position of a palpable mass made approach from the median line advisable the curved transverse incision with longitudinal separation of the recti (the incision which I habitually use instead of median laparotomy) was employed. In all the others McBurney's intermuscular gridiron incision was used. My preference for



the latter has long been unshaken and is, I think, unshakable, and I deem it one of the most valuable of the many valuable things we owe its distinguished author. It not only leaves the wall unweakened after recovery, but it also wholly avoids injury to the nerve supply of the rectus. With care and patience it gives ample room in most cases for the necessary intra-abdominal work, and if more space is needed it can be easily had by extending the cut in the fascia across a portion of the sheath of the rectus and drawing that muscle inward, or, if room must be made upward, by cutting upward alongside the rectus for an inch or so. The work ended, this supplementary incision is closed with interrupted sutures of chromic catgut, and I have seen no ill consequences follow. In the 98 cases it was used 5 times. The extension into the sheath of the rectus is noted in only 6 of the histories, but I am confident that it was made to a slight extent in several others.

As soon as the cavity has been opened, and if it is dry, the finger is cautiously introduced to determine the situation of the appendix and the general conditions. Of the simple cases it is not worth while to speak, for the technique of the removal of the appendix presents no serious question. If the finger finds a mass, one or two flat sponges are pressed in and tucked down on the lower side to crowd back the intestines from the iliac fossa and protect them and the hollow of the pelvis from possible contact with pus, then the finger seeks lines of least resistance in the mass and is cautiously pressed onward, usually between the mass and the posterior parietes, while an assistant stands ready with stick-sponges. As soon as pus is felt or seen it is quickly sponged away as it flows out from the little abscess, and when the flow has ceased the sponges are passed into the cavity until it has been thoroughly dried. Then the finger again enters the abscess cavity and seeks to free the appendix. It seems to me advisable to do by touch as much as can be so done, rather than to make wide exposures in order to see. One can generally recognize by its greater resistance the portion of the meso-appendix which contains the artery, and can safely tear through the rest if he cannot readily

expose it for ligation. Such bleeding as ensues soon stops or the point can be exposed and caught.

If the appendix can be thus found and freed I usually secure the stump by simply tying it with a catgut ligature after having cauterized its interior with the fine Paquelin point. When the base of the appendix and adjoining wall of the bowel are not inflamed and can be brought into easy reach I use the purse-string silk suture and invagination of the stump but I never use it when the wall has been softened by inflammation. In two cases the appendix has separated at its junction with the cæcum leaving a rather large opening. This I closed with sutures in the usual way.

When the appendix is found detached or has been torn away by the manipulations used to free it I make no great search for its stump if it is not readily accessible but leave it for spontaneous closure. Three stumps in this list were thus left untied with no recognizable ill results. A fecal odor may persist for some time in the discharge but not longer than in other cases where the stump has been tied or there may be a slight admixture of feces in the discharge for a few days.

If the appendix is not accessible without a wide exposure and extensive separation of adhesions if the patient is old and feeble or his condition grave I content myself with simply wiping out the cavity and providing drainage. In 7 of the cases in this list the appendix was thus left untouched and in only 2 of them did it give rise to further trouble in each after an interval of two months. In one which had fully healed the patient returned with the usual symptoms of an attack. I opened him along the scar found a small foul abscess and the appendix easily accessible and removed it. In the other a sinus had persisted. I enlarged it and easily found and removed the appendix. Of the 98 cases of the list in 37 the stump was invaginated with a purse string suture and in 49 it was simply tied.

Of course it is well that an inflamed appendix should be removed there is probably even no important loss to the patient in the removal of a healthy appendix but I am sure

that the removal of the appendix is not necessary to the cure of an appendicitis and possibly not even to the patient's reasonable security against another attack. At least, in one case in which for various reasons I felt constrained to limit my interference very narrowly, I saw a simple half-inch opening in the abdominal wall, with immediate escape of pus and diaphragm for a few days, followed by complete freedom from attacks for a period that is now nine years. And yet the patient had previously suffered for two years from repeated attacks.

In the young, such caution may be superfluous, but in the old, whose tissues and organs have felt the strains of competition, luxury, or want, whose abdominal walls are fat and flaccid, the less draft we make upon them the better. And so, too, with those who are very ill let the operation be limited to the life-saving indications, and let us not take a counsel of perfection which adds a strain that may be beyond the patient's powers of resistance.

If the pus is not encapsulated, if it lies free between the cæcum and the wall, perhaps with some free thin exudate showing at the incision, it is treated in the same way—carefully sponged out and the area dried. So, too, if there is also a collection within the pelvis, a few introductions of sponges on handles will remove it. Occasionally, when the collection has been larger than usual, I have removed it by washing with salt solution, using a double tube which afforded an easy escape for the wash and aiding the escape by keeping the sides of the incision wide apart. In the cases of extensive and general peritonitis, likewise, I have used the same tube, but always under low pressure and with free escape, and using only small quantities of water, just enough to effect the removal of so much of the exudate as would easily come. The main reliance has been upon gentle sponging. This seems to me safer than large incisions and abundant washing, and I am not sure that even less would not be sufficient in those graver cases, as it has proved to be in the less extensive peritonitides of the III and IV Groups. And it leaves the patient, in the case of survival, free from the weaknesses and discomforts of large

abdominal scars Space is lacking to give the histories of these graver cases in detail I must leave you to estimate their gravity upon the length and continuity of the list and the extent of the peritoneal reaction In addition in the few of the 12 recoveries of the first two groups in which the leucocyte and differential counts have been preserved the divergence from the normal line set by Dr Gibson was on the dangerous side and the bacterial examination showed mixed streptococcus and *B coli communis* infections

Drainage was used in all of the first four groups and in 29 of the 48 cases of the last three groups Three forms of drains were used first and most frequently the cigarette drain secondly small strips of gauze either alone or in conjunction with the cigarette and in 6 cases where the need seemed to be slight only a strip of rubber tissue In the cases of the first three groups the cigarette drain was passed down into the pelvis and sometimes a second one or a strip of gauze passed upward toward the liver or toward the opposite side In one of the cases of general peritonitis a second opening was made on the left side for a drain These cigarette drains have always been removed or much shortened within three or four days and the gauze strips have been taken out on the second or third day The retention of the short drains leading to the abscess cavity or the stump of the appendix has been determined by the amount and character of the discharge They have been used also in a few clean cases in which there has been much oozing or tearing of adhesions In one case of large faecal abscess lying close by the promontory of the sacrum and reached by the median route the drain was passed through a counter-opening in the loin

I am strongly convinced of the value of drainage and would not willingly forego the feeling of security which it gives I am quite ready to concede that many of the cases in which I use it would recover without it but what weighs upon me is the uncertainty lest there may be some among them in which its absence will mean an added danger another operation or even death Its disadvantages are not more I

think, than trifling inconveniences—a brief delay in the final cicatrization of the wound and a momentary pain in the withdrawal. The rubber drain has not even those if it is removed on the first or second day. Why should we leave even a small post-operative exudate or bleeding to be cared for by the peritoneum when it is so easy to remove them?

Finally, it has been urged, with statistics to support, that in grave cases abstention will save more lives than operation. This list contains 13 cases of general or extensive peritonitis with only one death. Suppose that not all of the cases should be counted as grave. Cut the list in half and call it 6 cases with one death. Can abstention do better? Is not the question rather one of the extent and character of the operative interference? Let that be brief and limited to what can be done quickly, easily, and with the minimum of exposure and handling of the intestines, and even, if necessary, to drainage alone. Surely nothing is lost by providing an escape for the exudate and reducing the task of the body to taking care of the bacilli and the toxins which it contains. I do not even ask for the washing of the cavity. As I have said, I use it only in moderation as a gentle means of quickly removing a large amount of exudate, with no thought of making that removal complete. In short, let us remember that we are dealing with very ill patients whose strength is already taxed to the utmost by their disease and who have no reserve with which to meet the drafts we may make upon them, and let us reserve our ideally complete operations for the young, the strong, for those appendices whose potentiality for harm has as yet been only slightly manifested.

## MOTOR BOAT FRACTURES

BY HENRY P DE FOREST M D

OF NEW YORK.

S g t h P l D p riment

SINCE the days of prehistoric man certain occupations have been productive of certain peculiarities of physical development and have been attended by certain accidents as direct results. Were records available of the physical condition of the early hunters we would find bow fingers as well as bow legs. With the advance of civilization these physical characteristics became more numerous and more generally recognized. A monograph for the use of expert criminologists in Paris describes several hundred varieties of callosities and deformities caused by occupation. Hardly a trade can be mentioned that does not produce certain well marked physical characteristics if the same posture or motion be continued for any length of time.

Such stigmata are of chief value to men who are working with Bertillon methods for the purpose of identifying individuals but at times they are of such severity as to require medical treatment. In the domain of surgery housemaid's knee miner's elbow and porter's shoulder have been recognized for years while writer's cramp is equally well known to physicians in general.

The occupations that produce such lesions are in most instances necessary ones and can hardly be given up or avoided but of recent years with the advent of many new kinds of sport it has been found that the favored few who have little to do but play instead of work are by no means free from similar conditions. Base ball finger was the first of these to appear and then in turn came lawn tennis elbow foot ball knee runner's leg catcher's shoulder and bicycle face.

The list of games that may demand a price of similar value

in return for their enjoyment might be extended to a considerable length Foot-ball, tennis, base-ball, hand-ball, lacrosse, bicycling, hurdling, and foot-racing all contribute to the list In the more violent forms of athletic exertion "putting the shot" not infrequently causes serious sprains

CASE I—Mr W J D, a doorman in the police department, while engaged with some of his friends in "putting the shot" felt a sudden and severe pain in his right elbow He paid no especial attention to the matter until the following morning when his arm was found to be greatly swollen and irregularly ecchymotic The disability continued He reported sick but did not admit the cause of the injury at first, stating that he was subject to rheumatism Some months later a considerable contracture persisted and when he first came under my care the joint was almost useless The exact nature of the trouble was only determined by the use of Roentgen rays The radiograph showed no injury to the bones He was accordingly sent to the hospital and anæsthetized with gas As soon as volition disappeared the joint was fully extended and after free flexion and extension it was secured in full extension by a splint The following day, because of some pain in the arm, he removed the splint and the arm at once returned to its original angle of contracture He declined to have anything further done to the arm and now, about 3 years after the injury, the contracture still persists (Fig 1)

Even the simple and ancient game of quoits is not free from danger to the participants, aside from the risk of being struck by the quoit itself The sudden twist of the wrist given as the iron leaves the hand may in itself do damage

CASE II—Mr T K, a patrolman in the police department, while playing a game of quoits felt something snap in the right wrist and pain and swelling developed after a short interval The radiograph showed that the ligament had torn loose from the styloid process of the ulna and that a considerable separation of the bones at that part of the wrist joint was the result Immobilization for about a month was needed to secure good functional result (Fig 2)







FIG 2 —Radiograph showing sprain of right wrist with rupture of styloid ligament, caused by "pitching quoits "

During the bicycle craze a number of cases were observed by the writer in which the constant vibration of the handle bar during long rides over rough roads produced numbness and even temporary paralysis of the fore arms and in one or two cases the hard and small wooden saddle caused similar conditions of the legs combined with severe sciatica. The vibration of the machinery and steering wheel of the modern automobiles has already caused similar symptoms in chauffeurs. Even physicians who drive their own cars are not exempt and the writer has at the present time under observation a surgeon whose skill as an operator is seriously impaired by the wide muscular tremor that his hands have acquired since he joined the ranks of those who use horseless carriages.

Still more recent are the injuries that have been received by those who are using motor boats and to the effect the present article especially directs attention. In most instances the machinery of the boat usually with gasoline as a motive power is started by hand. The more or less heavy balance wheel of the engine has a permanent handle projecting from the rim or a heavy brass or iron rod sunken in a socket and held in place with a spiral spring when not in actual use. When the engine is started this handle is seized and the wheel turned quickly around. If the gasoline and air mixture is right and the electric spark really sparking a single turn may be all that is necessary to start the series of explosions within the cylinder that drive the engine. It frequently happens that the conditions are not right for a great variety of reasons which can be learned by the hour from the owner of any motor boat. In any event the wheel has to be turned a number of times before the engine will start. One hand is used it becomes tired the other is used it too becomes tired then both are used. Ultimately if all goes well the shaft becomes heated or the water dries out of the gasoline tube or the carburettor produces a good mixture or something else happens and the machinery starts sometimes with great rapidity. The handle escapes from his grasp flies around and before the man has time to get out of the way he is struck by it on the hand. In case the

handle is in a socket, the spring is supposed to bring it flush with the rim of the wheel as soon as it is released, but if the handle is rusty, or the spring is weak, or the handle binds in the socket, this does not always occur, and injuries with this type of handle are as frequent as when a stationary pin is used

The injuries that result from this impact are usually trifling, but the following series of cases which occurred at a single wharf during the past summer will show that some of them may be very serious. Inquiry at other places would doubtless give other and perhaps larger lists

CASE III—Mr A D, aged 30, while starting his gasoline engine was struck on the calf of the left leg by three successive revolutions of the fly wheel. The bones of the leg were not fractured but the clothing was torn and a considerable portion of the gastrocnemius muscle was torn away in the badly contused and lacerated wound that resulted. The first impact was so violent that the leg was numb and he could not move for a moment or two. Considerable loss of power in the leg still remains after some months and a marked limping gait will probably be permanent

CASE IV—Mr J S, aged 35, injured in a similar manner. The handle struck his right hand before he could get it out of the road and badly lacerated the index and middle fingers, breaking the middle phalanx of the latter. Recovery uneventful

CASE V—Mr C S, aged 22, was struck by the stationary handle of his gasoline engine and the first phalanx of the index finger of the left hand was fractured. Recovery uninterrupted

CASE VI—W S, a sergeant of police, aged 42, was injured in a similar manner. the sparking adjustment was wrong and the wheel flew backwards, the handle striking him on the back of his right hand. When this case was seen after twenty-four hours there was considerable swelling and ecchymosis of the hand. At the first of the examination a distinct crepitus was felt but only once, and continued manipulation could not again elicit this symptom. In the belief that there was some obscure form of fracture present, the patient was radiographed and it was discovered that the blow, occurring on the side of the metacarpal of the right index finger, had caused a linear fracture



I 3-R 1 π j l h l ex fra t f f l l h l Ca ed  
t l f h fl f ot bo t g



FIG 4 —Radiograph showing "tent shaped" fracture of fourth right metacarpal bone. Caused by recoil of handle of motor boat engine

extending proximal into the joint. Only at the very tip of this fragment could crepitus be felt (Fig 3). A moulded metal splint was used and an excellent result was obtained. At the end of five weeks he was again able to return to desk duty. Such a linear fracture is unusual.

CASE VII—Mr C B, aged 34, was another victim. In his case also the explosion took place at the wrong phase of the engine cycle and he was struck on the under side of the right hand in the middle of the palm. The fourth metacarpal bone received the brunt of the impact and was fractured at its middle in an angular direction so that the ends of the fragments of bone formed a tent like elevation upon the dorsum of the hand. The deformity produced was more pronounced than usual for in most instances the adjacent bones act as splints and the broken bone is held in good position in this manner. The angular deformity is shown in Fig 4. With the aid of the radiograph a pad was placed over each extremity of the bone on the palmar side and a single pad over the angular projection on the dorsum. Two small glass rods with rounded ends on each side of the bone corrected the tendency to lateral displacement and with these occurred in a moulded metal splint the result was excellent.

CASE VIII—Mr B C, aged 33, was injured by a similar blow upon the back of the right hand. His hand became much swollen and discolored but he thought it merely a bruise and did nothing for it until two weeks had passed when the continuance of the symptoms caused him to come for treatment. With the former cases in mind although no crepitus could be detected a radiograph was made and a transverse fracture of the fourth right metacarpal bone was found (Fig 5). The bone was in perfect alignment and was held so by the action of the two adjacent metacarpal bones. This plate is also interesting as it shows another form of injury received in playing a baseball finger due to a fracture of the first phalanx of the little finger received some years ago. In this case a simple splint for immobility was all that was needed to secure an excellent result with no deformity.

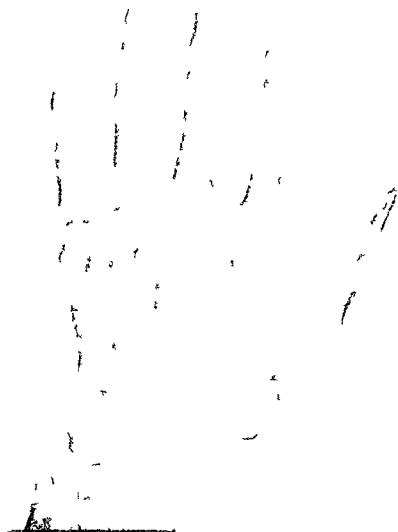
CASE IX—Mr F S, another member of the police force of the city, aged 48, received a more serious injury. He was struck by the flying handle upon the left wrist and the radius was fractured in two directions giving lines like the letter \ (Fig 6).

The force of the impact was received upon the dorsum of the wrist and the resulting deformity was that of an exaggerated Colle's fracture. Good recovery in five weeks.

CASE X—Similar to Case VII but still more serious, was that of Mr W F who was struck in a similar manner upon the wrist, but from beneath, by the flying backward of the released handle. A compound fracture of the right wrist resulted and considerable laceration and contusion of the soft parts about the broken radius and ulna. So severe was this injury that it seemed probable an amputation might be necessary. This was averted, however, by carefulness and cleanliness, and a fair result was obtained.

CASE XI—Drowning does not seem at all likely to occur as a result of such an injury, but this was nearly the fate of Mr A S, a slender man of 23, who was engaged in starting the engine. The explosion again occurred at the wrong cycle, the handle flew backwards and struck his right wrist on the upward turn of the wheel. The force of the blow was so great that not only did he sustain a compound fracture of the right wrist but he was thrown bodily overboard into the waters of the bay. He was no swimmer and was so stunned by the injury that, had not help been promptly at hand from those who saw the accident, the victim would have drowned. It is probable that some portion of clothing became entangled in the handle of the wheel and so gave sufficient attachment to throw him overboard. A serious illness resulting from the immersion developed, in addition to the shock of the compound fracture, and operative procedures and it was some weeks before he finally recovered. It is not unlikely that one or two drowning accidents noted in the daily newspapers during the past season occurred in a similar manner, as motor boats have been found running without a driver and the body of the man was afterwards found injured and drowned.

Similar injuries occur during the "cranking" of an automobile, and once the attention of the surgeon is directed to the subject it is surprising how many cases can be secured. During the past month while the matter was uppermost in his mind the writer has had his attention called to a number of such accidents.



I 5-R d graph t b l t h t t m f f t h r t l b v c sed





FIG 6—Radiograph showing V shaped fracture of left wrist caused by recoil of handle of motor boat engine

CASE XII—W B B a physician while engaged in starting the engine was struck on the right wrist by the rebound of the crank at the time of the primary explosion. The radius was broken close to the wrist joint and in two places very similar to those shown in Fig 6. This physician reports that he has had about six cases similar in character in his personal charge during the past year. He lives in the neighborhood of a garage and they have been sent to him for immediate treatment.

CASE XIII—Dr C D another medical man met with a similar experience. In his case instead of pushing down on the handle with the arms rigid he was nearly at the highest point of the circle when the explosion occurred. The crank did not leave his hand but the backward impulse was so sudden and so violent that the radius was broken completely across. The ulna was not injured (Fig 7). The deformity at the time of injury was extreme.

CASE XIV—Mr T A R while cranking his machine had the spark too far advanced and the explosion occurred at the wrong phase of the engine. the handle flew backward striking him below the knee breaking both bones of the leg.

Two cases have been called to the writer's attention in which the patella was broken. Minor injuries to the leg and particularly to the knee are common. The daily press (*New York Sun* November 1 1906) has recently reported a case in which the nose was broken and the skull was also fractured.

*Type of Fracture*—The fact that the initial velocity of the flying handle is much greater than that of the human body in case of a fall or of that of falling timbers stones and the ordinary causes of fracture in everyday life has a marked effect upon the lines of fracture and causes them to resemble those produced by large calibre projectiles without the penetrating effects. The fracture as a rule occurs at the point of actual impact and is rarely transmitted to the weaker parts of the bone. So localized indeed is the injury that fragments of bone may be broken off or such small bones as those of the carpus may be individually broken. The lines of fracture are as a rule quite straight and the direction taken may be most unusual.

Diagnosis is often quite difficult, and the use of the fluoroscope and radiograph is imperative in cases of doubt

The hand and wrist receive the greater number of injuries, but the fingers are pushed aside easily and quickly so that fractures in the phalanges are not common. On the other hand, the metacarpal bones seem to be fractured most frequently, and injury to the carpus, sprains or even an actual fracture is not rare. When the force of the blow is expended directly upon the fore-arm or leg the injury may be more severe, and compound fractures are not uncommon in these localities

*Etiology* —When these cases are studied to determine the cause of the explosion taking place when the driver is unprepared or during the wrong phase of the engine cycle, it would appear that the majority are due either to carelessness or to ignorance. Too many persons buy a car or a boat, are taken out for a trial trip, are shown the essentials of starting and of stopping, buy the machine, and fancy that by reason of having paid the purchase money they are thereby granted the degree of mechanical engineer. The dangers are slowly becoming known and actual schools for instruction for the complete construction and management of motor-boats are now established. The first of all to be established is maintained by the Y M C A of this city, and the practical demonstrations of their craft on the Harlem on Friday and Saturday afternoons, with the numerous apparent accidents, have caused the uninitiated to call it the "Jonah Boat"

The best of instruction cannot prevent carelessness, and the attitude taken by the manager of a motor company, who sustained a badly injured wrist with fracture of one of the carpal bones and a resulting excision and did not care to have the case reported for several reasons, shows that familiarity does not protect against the possible danger

All agree, that most of the accidents occur while the handle is being pushed downwards with the weight of the body upon the rigidly held and extended arms. If the handle is pulled up it is safer, and if the explosion does occur at that time

F A d R t h i e f s h d i n k e i b i





the handle flies away from the grasp and is much less apt to do damage to the driver. In automobile accidents the legs receive the larger number of injuries as the crank is higher from the ground. In the automobile however the force is transmitted from the crank to the engine through the medium of a ratchet so that the crank does not continue to revolve. Then too if the effort be made always to stand clear of the crank and apply the force by pulling up instead of pushing down the chance of accident is greatly lessened.

With motor boats especially those whose engines have been placed in sail boats cat boats dories and the like to give auxiliary power when needed the mechanism is much more simple and the space in which to avoid the flying handle is much less. Accidents are common enough in both classes and with a little effort the above record could be greatly amplified.

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, March 13, 1907*

The President, DR GEORGE WOOLSEY, in the Chair

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### DORSAL MENINGOCELE

DR WILLIAM A DOWNES presented an eight months' old infant, which at birth had a pure meningocele the size of a walnut in the dorsal region of the spine (Fig 1) It gradually increased in size, but under very careful protective treatment it never became inflamed nor irritated, and gave rise to no ill-effects There was no associated deformity or malformation The patient was brought to the Babies' Hospital, and operated on last December A circular incision was made through the skin, and the pedicle of the tumor was dissected out It communicated with the spinal canal at about the level of the third dorsal vertebra The child made an uneventful recovery, and there had been no leakage since the operation

Dr Downes called attention to the size and unusual location of the meningocele and the fact that it was covered by membranes almost entirely A slight strabismus which existed at the time of the operation had disappeared The child is now perfectly well and there is no evidence of hydrocephalus which often follows operation for the relief of this condition, especially when situated in the sacral or cervical regions

DR ROYAL WHITMAN said that in his experience club-foot was more often associated with spina bifida lower down, and in such cases it was often accompanied by partial or complete paralysis and loss of sensation,—rather unusual complications when the defect was of the upper portion of the spine

DR GEORGE WOOLSEY thought that a meningocele proper

was rarely seen so high up as in the case shown by Dr Downes. The usual location of these tumors was in the lumbosacral region. Another peculiarity of the case was the incomplete skin covering as most pure meningoceles had a complete covering.

## TUBERCULAR PERITONITIS

DR CHARLES N DOWD presented a girl twelve years old who was first seen by Dr Geo M Ball on Saturday night November 24 1906. She had apparently enjoyed good health up to the preceding Thursday morning although she had had two or three previous attacks of pain and vomiting. On Thursday she had had a severe attack of vomiting and her bowels had moved slightly twice. On Friday morning she vomited once and two or three times on Saturday. The vomitus on that day had a faecaloid look and in the evening was very forcible in character. She stated that all day she had had difficulty in preventing vomiting. There was moderate rigidity in the right hypochondrium but no abdominal distention. Her pulse was 90 temperature normal. She was taken to St Mary's Hospital at once. The vomiting persisted during the night and on the following morning the temperature was 99.5 the pulse 130 the rigidity had increased and was especially marked on the right side of the abdomen. There was no distention.

Operation was done without delay. Upon opening the abdomen there were well marked evidences of tuberculosis of the appendix the head of the colon and the lower end of the ileum. The appendix was removed. An abscess cavity containing about 2 ounces of tubercular pus was found in the mesentery about 5 inches above the ileocecal valve which had by its pressure produced absolute occlusion of the intestine at that point. It was emptied by sponges and the patency of the intestine was thus restored. There was considerable free serum in the lower part of the abdominal cavity. The abdomen was closed without drainage and healing occurred by primary union without incident thus again illustrating the desirability of omitting drainage in these cases. The patient made a good recovery and had since remained in excellent health. She has gained in weight has had no further intestinal symptoms and now appears to be very vigorous and strong.

DR. DOWD presented a second case of tubercular peritonitis



in the person of a girl, nine years old, who came under his observation on April 25, 1905. She had enjoyed good health until two weeks prior to that date, when she began to complain of pain in the right side of the abdomen, with irregular fever, and loss of appetite and strength. Upon admission to the hospital, there were evidences of fluid in the abdominal cavity.

Operation, May 1, 1905. The omentum was found much thickened, it was at least 2 inches thick and extended very little below the umbilicus. A section taken from it showed extensive tuberculosis. The intestines also were studded with tubercles wherever they were seen. After this operation, a sinus persisted in the abdominal wound, and the child was sent to the country for two months. Upon her return the sinus was curetted, and the wound ultimately healed. She was discharged from the hospital January 30, 1906, and had since remained in good health, and is now the picture of ruddy strength, although in all probability many tubercles still remain within the abdomen.

#### TENDON TRANSPLANTATION

DR CHARLES N DOWD presented a boy who was six and a half years old when he came to St Mary's Hospital on May 18, 1905. Four years prior to that date he had fallen and injured his back, and for eighteen months subsequent to that injury he was unable to walk. At the time of his admission to the hospital there was marked atrophy of the extensor muscles of the left leg and thigh, and the left foot was inverted to such a degree that he hobbled about on its outer edge.

Operation. The tendon of the tibialis anticus was split, the division being carried well up among the muscle fibres. The posterior half of the tendon was left attached in its normal position, while the lower end of the other half was separated from its attachment, was carried outward and secured to one-half the tendon of the peroneus longus, which had also been split, but the displaced part was severed at its upper end.

The result of the transplantation was excellent, and the inversion of the foot had been practically corrected. Even without the aid of a short steel support, which the boy still wore, he was able to walk with entire comfort, and placed his foot squarely on the floor. Since nearly two years have elapsed since the operation, a fair trial has been given to the procedure.

DR ROYAL WHITMAN said that when tendon grafting was first introduced it had been regarded by many as an actual cure for various deformities of the limbs especially as the immediate results were usually very striking. Further experience however had demonstrated that partial relapse was the rule. He considered it as of comparatively limited value unless combined with other procedures such as arthrodesis at the centres of deformity or unless as in the present case a protective brace was worn.

The speaker also called attention to the importance of splitting a muscle high up and separating it completely into two parts if it were to act effectively as independent muscles.

DR DOWD said that in several cases where he had split the tibialis anticus he had found it a very satisfactory procedure and that it was an excellent measure in helping to maintain the equilibrium of the foot. He agreed with Dr Whitman that a complete cure should not be looked for by tendon transplantation and that some kind of a brace should be worn continually to help maintain the position. In this case it had certainly accomplished a great deal since the boy placed his foot squarely on the floor and with the help of an inconspicuous drop foot brace he was able to walk with almost a normal gait.

#### CARCINOMA OF THE BREAST AT SIXTEEN

DR GEORGE E. BREWER presented a negress who had been admitted to the Roosevelt Hospital in January 1907 suffering from a small hard nodule in the upper and outer quadrant of the right breast. She stated that as long as she could remember there had been a small round ball under the skin near the areola. This was not painful and had given her no trouble until six months ago when it began to grow larger and apparently gave rise to painful sensations in the breast.

On examination a hard somewhat elastic oval nodule was felt which was distinctly circumscribed and freely movable. It had no attachment to the skin nor to the pectoral muscles. The nipple was not retracted and no axillary lymph nodes could be felt. The growth was regarded as a fibro-adenoma which was possibly cystic.

The tumor together with a small amount of breast tissue

was removed through a straight incision radiating upward and outward from the nipple. On microscopic examination the growth was found to be an intracanalicular adenopapilloma which had undergone distinct carcinomatous degeneration. As soon as the pathological report was received, the patient was again etherized, and a complete Halsted operation was done. Her recovery was uneventful.

DR WILLIAM B. COLEY said he had never seen a carcinoma of the breast under the age of twenty. Among the 2,713 cases of carcinoma of the breast recently collected by Heiman, there were only 4 under the age of sixteen—about 1 to 700. Under the age of twenty there were 7 cases, the proportion being about 1 to 400.

DR PARKER SYMS said that Beatson of Glasgow had called his attention to one point in the differential diagnosis between benign and malignant tumors of the breast. In the former, the nipple line on the affected side would be lower than that on the opposite side before there had been retraction, while in a malignant case the nipple line on the affected side would be higher than that on the opposite side.

In connection with this general subject, Dr Syms asked the opinion of the members as to the propriety of making an exploratory incision in a case of breast tumor of a doubtful nature, and how much risk accompanied such a procedure. He said that he resorts to this procedure occasionally.

DR DOWD thought it was very desirable to make an exploratory incision into a breast tumor of doubtful character before determining the extent of the operation. He knew of cases where such a precautionary measure would have prevented the performance of radical operations for fibroma and inflammatory growths in this region. At best, the radical operation occasionally resulted in considerable discomfort, with occasional swelling of the arm and pain on the affected side, these were defects that did not apply to the old Volkmann operation. For that reason, a preliminary incision, with the examination of sections by the freezing microtome, was very important in certain cases. It is done under anæsthesia as a part of the regular operation.

DR WOOLSEY said he had always regarded a preliminary incision and the immediate examination of frozen sections a safe and desirable measure in the differential diagnosis of breast

tumors As an additional safeguard to prevent infection he advised cauterization of the cut surfaces and if the growth proved to be malignant the radical operation would of course be indicated at once The complete removal of all the glands and surrounding tissues would prevent the spread of any cancer cells set free by the incision into the tissues beyond the field of operation

DR E S JUDD of Rochester Minn suggested the advisability of removing every tumor of the breast as soon as it was discovered irrespective of the age of the patient

DR COLEY agreed with Dr Judd that it was very important to remove these so called benign and cystic tumors as soon as they were discovered He recalled one case at the General Memorial Hospital where a cystic tumor of the breast had been treated by another surgeon by hypodermic puncture three years before Three years later the cystic tumor had degenerated into a typical carcinoma and the disease was too extensive to permit a radical cure

DR BREWER said he was not in sympathy with the rather widespread belief that it was dangerous to make an incision into a doubtful tumor of the breast His own practice was that when even he had to deal with a tumor of the breast it should be freely extirpated and then frozen sections should be immediately examined in order to establish its true character In a recent text book on surgery it was stated that there was very little evidence to show that benign tumors of the breast ever became malignant This Dr Brewer said he considered bad teaching as he could personally recall at least three cases seen in one year where benign tumors had become malignant The case he had shown at this meeting was another example of the same kind The speaker emphasized the importance of the removal of all these tumors as soon as they were discovered

#### THE SURGERY OF PERITONEAL TUBERCULOSIS

DR PARKER SYMS read a paper with the above title for which see page 95

DR JUDD said that he thought Dr Mayo's idea was that the primary lesion in the peritoneal tuberculosis was always some point in the mucous membrane and not in the peritoneum itself and the great desideratum in operating was to discover the loca

tion of the primary lesion. It was only by finding and removing the primary focus that a permanent cure could confidently be looked for. In the female, this primary focus was usually in the tubes—probably in three out of four cases. In the males operated on at Rochester the appendix, if possible, was removed in all cases, and it proved to be the primary focus of the disease in about 50 per cent. In several instances the primary lesion was found to be in the stomach, duodenum or gall-bladder, and in other cases there was a distinct tubercular lesion in the cæcum or ileum.

DR DOWD said that a review of the literature had suggested the query as to how much proof we had that simple incision of the peritoneum had much effect on peritoneal tuberculosis. The statistics did not show a very great preponderance in favor of cases operated on, and when we bore in mind the vague character of the symptoms in this condition, it was perfectly justifiable to assume that many cases of tubercular peritonitis had recovered in which the diagnosis had never been made. The speaker said that in the two cases he had shown at this meeting the condition had gone unrecognized until it was far advanced and there was a sudden outburst, evidenced in one case by intestinal obstruction, and in the other by an effusion of fluid into the peritoneal cavity. He had also looked over the histories of the cases which had come under his own observation and had found very little evidence of the curative effect of simple incision but abundant evidence of the evasive, indefinite nature of the disease. These cases numbered 29, verified by operation or autopsy. In 3 of them unsuspected, yet extensive, peritoneal tuberculosis was found in operation for hernia. In 3 instances the vermiform appendices were the site of the maximum inflammation and were removed. In 2 instances, pieces of tubercular intestines were resected with good results. In 2, tubercular uterine appendages were resected also with good results.

In 14 instances extensive plastic exudate was present. This is the type which authorities generally agree upon as unaffected by simple incision. In one of them who died from intestinal obstruction, a cure was supposed to have been accomplished by medical treatment. Another case illustrates very plainly the difficulty in diagnosis, a year and a half after the first operation another operation was done for persistent sinus, and the intestines

were found everywhere studded with tubercles although the abdomen was soft undistended and excepting for the sinus had seemed normal. The type with marked serous effusion is the one which is supposed to be most benefited by incision but this is the early stage of the inflammation in most instances and the one which is most likely to do well under any treatment.

In peritoneal tuberculosis Dr Dowd said we were certainly dealing with a very evasive disease and it was difficult to interpret the effects of treatment either medical or by simple peritoneal incision. While an operation in these cases seemed advisable it should not be undertaken on the ground that in some remarkable or mysterious way it would cure the disease but rather on the ground that by opening the abdomen we might discover the source of the infection and remove it.

Dr Coley said he was entirely in accord with Dr Dowd that this question of peritoneal tuberculosis was still very obscure and that it had not been absolutely decided that an operation would cure many more cases than would medical treatment. Neither did he believe that removal of the appendix would always effect a cure in this condition. The speaker said he could recall several cases upon which he had operated for hernia and had found the hernial sac studded with tubercles although the patients had given no symptoms pointing to a tuberculous lesion. In one case he had operated for a ventral hernia following an operation for appendicitis in which another surgeon had removed a tuberculous appendix two years before. The sac of the ventral hernia was filled with small tubercles as was also the neighboring parietal peritoneum. The patient continued to grow worse and died about a year later in spite of the two laparotomies.

Dr Brewer said that many of the cases that had been referred to illustrated a well recognized principle in surgery, namely that given a case of tuberculosis if we could remove the primary lesion the case would be able to take care of itself. This was noticeably so in tuberculosis of the kidney and other organs of the genito-urinary tract. After the removal of a tuberculous kidney for example the involved ureter would often be able to take care of itself.

Dr Woolsey said that he agreed with Drs Dowd and Brewer in regard to the importance of removing the original focus in these cases but he was not quite so optimistic in regard

to the value of the medical treatment. He could recall several cases with effusion where under medical treatment the patients had gone from bad to worse, and where an operation, even without discovering the primary focus, had produced at least a temporary cure.

In speaking of the primary focus in these cases, Dr. Woolsey said he had seen it in the several localities where it was most often found, including a number of times in the appendix. He recalled one of the first recorded cases of appendectomy, operated on by Dr. Hall in 1886, where the appendix had been removed for that distinct reason. The case was one of supposed hernia, and the tuberculous appendix had been found in the hernial sac. The speaker said he had recently operated on a Japanese where the primary tuberculous lesion was in Peyer's patches in the ileum. The retroperitoneal glands were also extensively involved, and there were tubercular lesions in other regions of the body, including the lungs. In one case of peritoneal tuberculosis where the patient refused a radical operation and injections of iodoform emulsion were advised, the method proved painful and unsatisfactory.

Dr. Syms, in closing, said the statistics of peritoneal tuberculosis showed that as far as we could compare series of cases, these patients did better under surgical than under medical treatment. While the serous type did fairly well under any treatment, the surgical treatment was superior to the medical. Mayo and others had shown that a large proportion of these cases were curable by rational surgical treatment, even where medical treatment and perfect climatic conditions had failed.

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*Stated Meeting, March 27, 1907*

The President, Dr. GEORGE WOOLSEY, in the Chair

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#### ACUTE DIVERTICULITIS OF THE SIGMOID, WITH INTRA-ABDOMINAL ABSCESES

Dr. GEORGE EMERSON BREWER presented a man, forty-five years old, who had hitherto enjoyed good health. He had never

suffered from digestive disturbances suggestive of appendicitis gall stone colic or peritonitis

In August 1902 while at dinner he was suddenly seized with an attack of abdominal pain with nausea and faintness which necessitated his leaving the table. The severity of the attack soon passed off and he was able to join his friends later in the evening. The following night proved a restless one as he had more or less constant pain in the lower portion of the abdomen which prevented sleep and at times was accompanied by nausea and general bodily weakness. The following day he continued to feel badly but he kept up and about for the reason that he was a guest at a country house and did not wish to inconvenience his host. Later in the day he went for a drive and suffered acutely from the jolting of the vehicle. In the evening he was obliged to call a physician who after an examination pronounced the case one of colitis. He returned to the city the following day and as the symptoms continued he remained in bed. During five days he continued to suffer with pain in the lower left quadrant of the abdomen together with fever and general malaise.

When Dr Brewer first saw the patient his temperature was 103 pulse 110 leucocytes 17000. There was marked rigidity of the left rectus muscle and a tender mass in the iliac fossa. He was immediately removed to the Roosevelt Hospital and under ether anæsthesia an incision was made over the most prominent portion of the tumor. After dividing the tissues of the abdominal wall a large abscess cavity was entered which contained about 4 ounces of foul pus and an oblong fæcal concretion. On washing out the abscess cavity a small ulceration was seen in the wall of the sigmoid through which there was a slight fæcal discharge. The cavity was packed with sterile gauze the wound partly united and a dressing applied.

After operation the temperature and pulse rapidly declined to normal the pain ceased and the appetite returned. The discharge from the abscess cavity gradually diminished until a cathartic was administered on the fourth or fifth day. This gave rise to a very abundant fæcal discharge which continued for several days. It then began to diminish and the sinus finally closed in about six weeks from the time of operation. He had since been in perfect health.



DR WOOLSEY said he had seen these diverticulæ of the gut at autopsy, but never as a cause of infection. The case shown by Dr Brewer was interesting as bearing on the etiology of left-sided intra-abdominal infection.

#### CARCINOMA OF THE SPLENIC FLEXURE OF THE COLON

DR GEORGE E BREWER presented a man, forty-seven years old, who was admitted to the Roosevelt Hospital in January, 1907, suffering from acute intestinal obstruction, vomiting, and marked prostration. He gave a history of having had numerous attacks of abdominal pain during the previous nine or ten months, which had always yielded to cathartics and a careful regulation of the diet. Two days before admission he had had such an attack, but the cathartic administered by his attending physician had failed to produce any movement of the bowels, and there had occurred vomiting, increased pain, and a progressive distention of the abdomen. When seen by Dr Brewer in consultation, the abdomen was uniformly distended and moderately tender. As numerous enemata had failed to bring about any evacuation, and as no gas had been passed for twenty-four hours, an immediate operation was advised.

Under ether anæsthesia the abdomen was opened in the median line. The small intestine and the ascending and transverse portions of the colon were greatly distended. The sigmoid was collapsed, and palpation revealed a hard mass in the splenic flexure. As the distended cæcum lay directly beneath the abdominal wound, it was opened with a trocar, and about 1 quart of fluid fæces evacuated. The small opening was closed, the bowel stitched to the abdominal wound, and reopened with the Paquelin cautery the following morning.

There was a moderate amount of shock following the operation, but after the fistula was established and the bowels freely moved, the patient's condition improved, and two weeks later a second operation was undertaken for the removal of the growth. The colostomy wound was sealed with gauze and rubber tissue and a long incision made over the descending colon extending from the twelfth rib to the iliac fossa. A dense carcinoma was found, involving about 3 inches of the colon, just below the splenic flexure. The transverse colon was brought into the wound, clamped, and divided about 2 inches above the growth. The

descending colon was freed from its attachments clamped and divided just above its junction with the sigmoid and the intervening portion of the gut and a generous piece of the mesocolon were removed. Both open ends of the intestine were closed and turned in by purse string sutures and a lateral anastomosis was made between the transverse and sigmoid portions by the suture method. The surrounding tissues were then thoroughly disinfected and the wound closed by layer suture a small cigarette drain being left in the upper angle.

The patient rallied well from the shock and aside from a moderate infection of the subcutaneous tissue of the wound he made a prompt recovery. On the fifth day following the operation a fair sized movement occurred by the natural passage and after that the colostomy wound gradually closed. When he was discharged from the hospital six weeks after the operation had been performed he had an excellent appetite and was gaining rapidly in both weight and strength. The microscopical examination of the specimen showed it to be adenocarcinoma.

DR WOOLSEY called attention to the fact that in the case shown by Dr Brewer the intestinal symptoms had been present nine or ten months. The speaker said he had seen two cases of carcinoma of the splenic flexure and in both of them there were no premonitory symptoms until the time of the obstruction which in the first case was absolute. The latter patient was brought to the hospital four days after the onset of the obstruction and an artificial anus was established. In the other case a resection was done.

#### BLASTOMYCOSIS OF THE SPINE.

DR GEORGE E BREWER presented a man twenty three years old a native of Russia who was admitted to the Roosevelt Hospital in January 1907. For the past six months he had suffered from pain between the shoulders stiffness of the back and a progressive loss of weight and strength. On examination a large fluctuating swelling was found between the scapulæ over the spinous processes of the third and fourth dorsal vertebra. On aspiration a dark chocolate colored fluid was withdrawn. There was moderate rigidity of the dorsal spine pain on motion and marked tenderness over the swelling.

Under ether anæsthesia, an incision, 15 cm in length, was made over the tumor, and the tissues divided until the abscess was reached beneath the erector-spinae muscles. About 4 ounces of pus were evacuated. On further examination, it was found that the spinous process of one of the vertebrae, together with a portion of its lamina and the arch of an adjacent vertebra, were exposed and more or less necrotic. These were removed, and the entire abscess cavity dissected out. The surrounding parts were then douched with a 1-100 solution of formalin, and the extensive wound united by deep and superficial sutures. Practically no reaction followed the operation, and the wound healed without suppuration. The patient left the hospital in about two weeks.

Three or four weeks later he returned, complaining of pain in the lumbar region, and upon examination a similar fluctuating tumor was found lying to the right of the upper three lumbar spines. The wound of the primary operation had remained healed, and free from tenderness. The second operation was similar in every respect to the first, with the exception that only the tip of the transverse process seemed involved. The recovery from the second operation was somewhat delayed by suppuration in the wound, but the patient was able to leave the hospital, completely healed, in three weeks.

Microscopical examination of the pus and tissues removed from both foci showed abundant blastomycetes. No cutaneous nor other primary lesion could be found, and there was no evidence of lung involvement or lesion of any other organ or tissue.

Dr Brewer said this was the first case recorded of an apparently primary blastomycotic lesion of bone, and the only case of involvement of the spine in which improvement or cure had been noted.

DR WILLIAM B COLEY said that he at present had under observation at the General Memorial Hospital a case of acute blastomycosis with very rapid generalization, which, apparently, was not primary in the skin. The patient, a man in vigorous health up to last December, began to have severe pains in the dorsal region of the left foot. The foot became very much swollen and in a few days showed fluctuation. Shortly after this two small nodules developed in the skin of the lower portion of the outer aspect of the right thigh. These were slightly elevated

above the surrounding surface presenting indurated edges and ulceration in the centre with a tendency to form dry scabs. Very soon four or five similar lesions appeared in the face. At about the same time the patient developed a dry hacking cough which has persisted ever since and has been almost constant. In addition to the skin lesions described a number of subcutaneous lesions appeared in various parts of the body the majority in the thighs some on the arms and some on the neck and forehead. These varied from the size of a hazelnut to that of a hen's egg. If left to themselves in a week or ten days they became very much softened showing fluctuation and finally ulceration in the centre discharging a brownish colored material of about the consistence of cream. In the fluid taken from such tumors before ulceration occurred pure cultures of blasomycetes were found which have been successfully inoculated into dogs producing similar tumors. The lesions in the face have almost entirely disappeared under applications of pure carbolic acid left on for a minute and followed by alcohol. The patient is steadily growing worse although he has been put on iodide of potassium getting as much as 250 grains a day. Hæmoglobin has fallen to 35 per cent. The case will be published in detail later.

#### PERSISTENT FÆCAL FISTULA FOLLOWING GENERAL PERITONITIS

DR GEORGE E BREWER presented a colored boy nineteen years old who was admitted to the Roosevelt Hospital in the summer of 1906 suffering from acute general peritonitis. He was operated on by Dr Charles H Peck who found a diffuse suppurative infection which apparently involved every portion of the membrane which could be seen through an incision extending from the ensiform to the pubis. As the condition of the patient was extremely critical and as the intestines were so matted together by inflammatory exudate as to preclude the possibility of an extensive search for the point of infection the large abdominal wound was rapidly closed in part leaving drains in the upper and lower angles. Considerable shock followed the operation.

He was critically ill for several weeks and during his convalescence developed two fæcal fistulæ one at the upper and one

at the lower extremity of the abdominal wound Through these two openings there poured out practically all intestinal contents for many weeks At times the condition of the fæcal discharge would be semi-solid, indicating a communication with the colon, and at other times the discharge would suggest a high jejunal fistula

The boy emaciated rapidly, and became extremely weak and anæmic He rallied, however, and the amount of fæcal discharge diminished, but as soon as he gained a little strength and was able to take more food the fistulæ would again enlarge, and great quantities of matter from the small intestine would then be discharged

In October he came under the observation and care of the reporter At that time he was exceedingly pale and thin, and presented the evidences of a poor surgical risk He pleaded so hard for operation, however, that it was finally decided to make the attempt On opening the abdomen, the upper fistula was found to lead to a sinus which passed along the portal fissure of the liver, and then downward along the right side of the ascending colon to about its middle, where it communicated with the colon by an opening as large as a silver quarter The lower fistula communicated with two loops of the small intestine, one of which was apparently the jejunum It also communicated with a sinus which passed to the right iliac fossa around the cæcum to the outer side of the ascending colon and joined the sinus from the upper opening The two openings in the small intestine were closed by Lembert sutures The entire sinus was next dissected out, and the opening into the colon closed by two rows of Lembert sutures, and reinforced by an omental graft The abdominal cavity was then closed, drains being left at four points in the course of the extensive incision

The operation was an exceedingly difficult one, and required nearly an hour and three-quarters for its completion One of the difficulties encountered was due to the fact that the intestines were absolutely matted together by a chronic tuberculous peritonitis, the progress of which had evidently been arrested either by the mixed septic infection or by the original operation for its relief

There was considerable shock following the operation, which was combatted by active stimulation The boy rallied slowly, and

eventually made a satisfactory convalescence. Although two of the drain openings supplicated at no time was there any faecal discharge from the wounds. As soon as he was able to be up and move about the ward he gained rapidly both in weight and strength.

DR L. W. HOTCHKISS said that during the past winter he saw a case somewhat similar to the one shown by Dr. Brewer. This patient was also a negro and had had an acute onset of abdominal pain and while an exact diagnosis was impossible there was apparently an acute peritonitis due probably to a perforation. Upon opening the abdomen the intestines at pyloric end of stomach were found somewhat reddened and the peritoneal cavity was filled with a non purulent fluid. The appendix, stomach and gall bladder were apparently normal. The case was regarded as one of the acuter forms of tubercular peritonitis although the cultures were negative. The abdominal wound subsequently broke wide open making a secondary operation necessary which resulted in a good union being obtained and the patient was discharged from the hospital apparently well.

#### SECTION OF THE COSTAL ARCH FOR BULLET WOUND OF THE LIVER

DR IRVING S. HAYNES presented a man twenty three years old who was brought to the Harlem Hospital on October 18, 1906 with a gunshot wound of the abdomen. The wound of entrance was just below the tip of the ensiform. There was no wound of exit.

As soon as possible a median incision was made under ether anaesthesia and the course of the bullet through the liver noted. In order to reach the exit wound in the liver the skin and right rectus muscle were divided transversely opposite the base of the ensiform and the seventh and sixth costal cartilages severed at about their middle. The falciform ligament was also cut through from the umbilicus to the top of the liver close to the abdominal wall and diaphragm. With strong traction upon the severed costal arch the posterior wound in the liver could be reached and felt but not seen. It readily admitted the index and middle fingers. By the fingers an iodoform wick was packed into this wound and a smaller wick introduced into the anterior wound in the left

lobe of the liver Both wicks were brought out through the abdominal incisions No wound was felt in the diaphragm

The packing in the liver wounds checked the hæmorrhage, but not entirely, until the liver was forced upward against the diaphragm To hold it there a large Mikulicz packing of plain gauze was introduced beneath it The rectus was sutured The peritoneum with the falciform ligament included, and the different layers of the abdomen sutured above and below the iodoform wicks Nothing was done to the severed cartilages

On October 29, the Mikulicz packing was removed and the gap in the abdominal wall closed by silk-worm sutures previously placed for such purposes A few days later the iodoform wicks were removed and rubber tubing substituted The discharge was very free, consisting of bile and pus

On November 10, an operation to establish drainage posteriorly was performed as the space behind the liver was not draining properly

Before this the bullet had been located in the mid-axillary line on the right side and about over the ninth rib The incision was made in this place and the bullet with the sac in which it was perfectly encysted removed entire One and one-half inches of the ninth rib was resected, the chest opened The costal and diaphragmatic pleuræ were united by very delicate and fine adhesions, so these two layers were firmly sutured to the external opening The pus cavity was located by an aspirator and the diaphragm opened alongside the needle

By means of a long curved probe passed from the anterior wound over the liver, a good-sized rubber tube was drawn from the posterior wound to emerge from the anterior one Further drainage was provided by a short tube into the abscess cavity The long drainage tube was removed after a few days and all discharge drained from the second incision

The case progressed slowly but satisfactorily He was out of bed on November 18, and left the hospital on December 4 He came back for a week's stay about three weeks later as the drainage was not satisfactory This was remedied by inserting a good-sized tube and firmly strapping the abdomen about his waist so as to crowd the liver upward and obliterate the abscess cavity These measures succeeded, though the discharge did not entirely cease until the early part of this month (March)

The interesting features about this case are The large hole through the liver—controlled by gauze packing within—and compression from below upward against the diaphragm The great amount of working space afforded by section of the rectus muscle and the sixth and seventh costal cartilages The prompt union of these cartilages without any special precautions The effective drainage of the subphrenic abscess from the mid axillary line over the ninth rib The presence of bile for a long time in the purulent discharge The escape of the patient from embolism for many of the large hepatic veins must have been thrombosed

#### COMBINED OPERATION FOR HERNIA AND FOR REMOVAL OF APPENDIX

DR WILLIAM B COLEY presented a man illustrating Torek's incision combining removal of the appendix with operation for inguinal hernia The patient was sent to the General Memorial Hospital about four weeks ago on the diagnosis of strangulated hernia It was found that only omentum was contained in the sac and that his acute symptoms were due to inflammation of the appendix Temperature and pulse were normal The operation was postponed for two or three days and then the usual Bassini incision for inguinal hernia was made the aponeurosis being incised  $\frac{1}{2}$  to  $\frac{3}{4}$  inch higher than usual By retracting the aponeurosis well it was very easy to separate the fibres of the internal oblique as in the ordinary McBurney incision The appendix was found acutely inflamed and removed the internal oblique sutured and then the hernia operation was completed in the usual way

A week ago Dr Coley did a similar operation in a boy of twelve Dr Coley reverses the order of the operation as practiced by Dr Torek who does the hernia operation up to the point of tying off the sac then beginning the appendix portion of the operation while Dr Coley believes it better to attend to the appendix first

#### SOME PRACTICAL DEDUCTIONS FROM PERSONAL EXPERIENCE IN THE TREATMENT OF APPENDICITIS

DR LEWIS A STIMSON read a paper with the above title for which see page 122



DR GEORGE E BREWER said that while the generally accepted views in regard to the proper treatment of appendicitis were apt to undergo modification from time to time, yet in studying the statistics presented by Dr Stimson—comprising a list of 98 cases operated on at a general hospital, with but 1 death—one could not but be impressed with the fact that the method of the operator was an important factor in the result. In this series of practically unselected cases, many of them acute, the mortality was about 1 per cent. The minimum amount of operative interference was probably responsible for the excellence of these statistics. The dictum was now generally accepted that the less we handled the inflamed intestines the better the result, the less we interfered with the appendix, the less would be the danger to the patient.

In regard to the question of drainage in these cases, Dr Brewer said he had passed through all the various stages, and his views on the subject were practically as follows. He believed that all acute cases in which there was no extensive peritonitis, should be closed without drainage, also, that all acute cases in which there was no necrotic matter, should be closed without drainage. When necrotic matter was present, he invariably used drainage. In the absence of necrotic material, he saw no advantage in drainage, as the drain simply benefitted the immediate neighborhood in which it was placed, and could exert no beneficial effect upon a spreading generalized peritonitis, such cases he thought were much more satisfactorily treated without drainage.

DR L W HOTCHKISS said he agreed entirely with the position as defined by Dr Brewer, and was very glad to know that the views of Dr Stimson coincided so closely with his own which he had taken occasion to express in a paper read before the Society in 1906. The only point of difference, practically, was as to the necessity of drainage in generalizing or diffuse suppurative peritonitis, meaning by this, a condition in which the pus was very generally distributed throughout the peritoneal cavity without visible encapsulation, and where the focal infection necrosis in and about the appendix was cleanly removable. In this class of cases, he had come to use minimal drainage in the form of a small cigarette to the appendical site or no peritoneal drainage at all, contenting himself with draining the external

wound only and allowing the peritoneum to take care of itself Dr Hotchkiss said he had tried all the various forms of treatment from the wide incision evisceration and gauze drainage down to his present method of the small McBurney incision development of the appendix by touch rather than by sight irrigation with saline solution of the peritoneal cavity when the pus was generally distributed and avoiding all unnecessary traumatism to the intestines from handling and exposure Under this plan he had reported one series of 72 cases in a period extending over the same time as Dr Stimson's cases a smaller series to be sure but still including 15 cases of diffuse suppurative peritonitis and without any mortality In the paper read before the society in 1906 he had reported 28 cases of diffuse suppurative peritonitis treated by this method of which 5 died

DR JOSEPH A BLAKE after referring to the extremely favorable results in the series of cases reported by Dr Stimson said that in his opinion the McBurney incision was the best for most cases and much better for the purpose of drainage than an incision along the outer border of the rectus In regard to drainage *versus* non drainage in peritonitis he did not think it wise to wholly uphold either one stand or the other While many cases could be safely left without drainage there were some in which we could not well get along without it One of the chief advances that had been made in the treatment of these cases was not in leaving out drainage altogether but in relieving the surgeon of the necessity of making multiple incisions and in inserting large pieces of gauze or drainage tubes Drainage was certainly indicated in dealing with a condition of local necrosis but even then rarely more than one drain was necessary inserted either to the iliac fossa or to the bottom of the pelvis The speaker thought it took considerable experience and judgment to decide whether drainage could be safely omitted or not and in doubtful cases he thought it better to err on the side of safety and introduce a drain Personally he always used a drain through the abdominal wall but he had largely done away with deep drainage

DR CHARLES L GIBSON said he thought the age of the patient in these cases should be considered in connection with the mortality rate He had come to expect young children with general peritonitis to recover even with an apparently extensive infection which would be apt to end fatally in an older individual

In regard to drainage, the speaker said he felt that Dr Stimson had re-established the subject on a sound, common-sense basis. One method of drainage which he had found very efficient and which contributed much to the comfort of the patient, was the use of a modified Mikulicz tampon made of perforated rubber dam, properly folded and placed, and filled with gauze. He regarded this superior to the ordinary cigarette drain.

DR HOTCHKISS said that most of his cases were young, *i e*, under thirty, 2, however, were over forty, and 1 was a man of fifty-eight.

DR STIMSON, in closing, said it had been a pleasure to hear so much testimony in favor of drainage, which was much more generally employed than he had supposed. As to the ages of his patients, to which Dr Gibson had referred, he could only state approximately that among the 13 cases of general or extensive peritonitis included in his list, 3 were under the age of twelve years, or that 2 others were under twenty.

In speaking of drainage in general peritonitis, Dr Stimson said he was quite ready to concede that good results could be obtained with less drainage than he had deemed advisable, but he wished to take exception to the statement that a drain in this region did not drain, and that it would always be prevented from doing so by adhesions forming in the course of a few hours, which would render it useless. On the contrary, he had seen these drainage tubes discharge freely for three or four days, in amounts far too large, he thought, to be supplied solely by the area immediately surrounding the drain.

Dr Stimson said that one of the chief objects of his paper was to emphasize his objection to the use of free and multiple incisions in these cases, laying open the abdomen widely with the idea of getting rid of every trace of exudate. He had a horror of that method, especially on account of its late results, such as the occurrence of ventral hernia, the relaxation of the abdominal wall and the general disability of the patient. While these patients perhaps escaped with their lives, yet many of them were practically cripples.

In dealing with limited suppurations, the speaker said he saw no reason for immediate closure of the wound. By doing that, a certain number of these patients would have their lives imperilled, and that risk could be avoided by the temporary use of a

drain running down to the site of the appendix a measure which did not delay convalescence and introduced no additional risk of its own. The average stay in hospital after operation of the patients of the last three or four groups in his list was the same whether the wounds were drained or not drained.

#### CYSTIC SARCOMA OF THE KIDNEY IN AN INFANT

DR. GEORGE WOOLSEY showed a specimen which he had removed in February 1907 from an infant four months old. At the time of its removal it was larger than the child's head. It had first been noticed about a month after birth and steadily increased in size until it filled about one half of the abdomen especially on the left side. It gave rise to no urinary symptoms and it was not until shortly before the time of operation that symptoms from pressure on the thoracic organs became marked.

Its removal was accomplished without much difficulty except for its adhesion to the peritoneum below the transverse mesocolon which was torn. It was found to consist of the left kidney or its posterior half from the front of which extended the tumor which was entirely cystic. Many of the superficial cysts had been ruptured during the removal. A pathological examination of the tumor made by Dr. James Ewing showed that it contained both sarcomatous and epithelial elements. He found none of the striped muscle tissue that was sometimes present in these mixed tumors (embryomata). The patient died of shock on the day of the operation.

#### DISLOCATION OF THE SEMILUNAR AND FRACTURE OF THE CARPAL SCAPHOID

DR. LEWIS A. STIMSON showed a specimen obtained from a man of thirty years who fell a distance of about 25 feet sustaining a fracture of the pelvis and an injury to the left wrist the latter consisting of a forward dislocation of the semilunar bone and a fracture of the scaphoid. The wrist joint was very movable and there was abundant crepitus with sensitiveness on pressure. The diagnosis was corroborated by the X ray and the semilunar and proximal fragment of the scaphoid were extirpated. Motion in the wrist is now limited but increasing.

DR. HAYNES spoke of some experiments in the dissecting room where he had produced a fracture of the scaphoid by flex

ing the wrist and then striking the dorsum of the hand a sharp blow with a heavy mallet Shortly afterwards Dr Downes reported to him a case where the injury had been produced by hyperextension

DR WILLIAM A. DOWNES said he had treated 4 cases of fracture of the carpal scaphoid this winter In 1 of these the injury was produced with the hand in the hyperflexed position, and was probably produced by direct violence, and in the other 3 the hand was in a position of hyperextension

## REVIEWS OF BOOKS

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THE TECHNIC OF OPERATIONS UPON THE INTESTINES AND STOMACH By ALFRED H GOULD M D of Boston Mass  
Large octavo pp 30. Philadelphia W B Saunders Company 1906

This book is the result of experimental work the aim of the author having been to study a mechanical subject in the only available way i e upon animals Of the multitude of intestinal and stomach operations which have been suggested during recent years only a limited number have proved of permanent value In the slow and cautious methods demanded in operating upon human beings his responsibility to the patient prevents the surgeon from trying to determine and to eliminate unnecessary technical steps

The operations chosen for the experimental tests were those most used to day and with that as a basis a discriminating and critical experimental study was carried out upon animals and the cadaver In the course of the work a great many new details came up which proved to be of importance heretofore not appreciated

The book deals essentially with the elementary details It is a book about technic and an understanding of the minutiae which combined make up the operation This means accurate technic

The first chapter deals with repair This is inserted to give the reader confidence that if the work is done according to the rules laid down later the healing of the intestines is bound to follow in fairly set grooves

A great deal of attention is given to tying knots suture material stitches needles clamps in order to show just how these are employed This chapter leads naturally to a brief consideration of the anatomical questions which are involved in intestinal operations

The completed gastric and intestinal operations are easily understood by one who has made himself familiar with the elementary matters

Surgical teaching is undergoing a change The success of the book depends upon the recognition of the source from which the data comes It is not hearsay, it is a discriminating criticism of the work of others in which are introduced a good many new ideas, in one case the entire operation is original

The illustrations are numerous and accurate, all possible details are cut out in order to focus the attention of the reader upon as small an area as possible This has demanded an increased number of drawings, but in the end it has distinctly made for clearness The number of drawings makes the text appear short, but the technical pictures in the text stand out as sharply as they do in the drawings

LEWIS S PILCHER

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A TEXT-BOOK OF DISEASES OF WOMEN By J CLARENCE WEBSTER, M D (Edin ), F R C P E , F R S E , Professor of Obstetrics and Gynecology in Rush Medical College Large octavo of 712 pages Philadelphia and London W B Saunders Company, 1907

In the preface to this volume the author states that he has endeavored to keep constantly before him the following aims

1 To give prominence to the scientific basis of each subject under consideration For this purpose the most thorough attention has been given to modern researches in sectional and dissectional anatomy, histology, embryology, comparative anatomy, pathology and bacteriology, in so far as they bear on diseases of women, and the author has included the chief facts collected by himself in original investigations carried on during the past sixteen years

2 To study clinical phenomena in their widest relationships

3 To insist upon exercising caution in the adoption of therapeutic measures not yet thoroughly tested, especially of

certain ones which have in recent years been recklessly advocated

4 To give emphasis to methods which have proved satisfactory in the author's experience

The author has carried out his plans and has presented the entire subject as fully as the scope and size of the volume permits. The chapter on anatomy is particularly good as it includes the results of the writer's own studies of this important part of the subject. The general plan of the work is excellent beginning with the anatomy (including embryology) then puberty and menstruation genital tract in relation to microorganisms, neurones in relation to pelvic diseases, case taking and physical examination, minor therapeutic measures and surgical technique. After this the various gynaecological conditions are considered including a chapter on Appendicitis in Relation to Pelvic Disease. The press work is a very creditable specimen of book making and while the heavy glazed paper increases the weight of the book it adds to its general appearance and the clearness of the illustrations.

Two features which especially commend the book are the thorough presentation of the anatomy of the pelvis and the description of the methods of diagnosis and treatment (including operations) which have proven most serviceable in the hands of the writer.

JOHN A. SAMPSON

ATLAS AND TEXT BOOK OF HUMAN ANATOMY Volume II By Professor J. SOBOTTA of Wurzburg. Edited with additions by J. PLAYFAIR McMURRICH A.M. Ph.D. Professor of Anatomy at the University of Michigan Ann Arbor. Quarto volume of 194 pages containing 214 illustrations mostly all in colors. Philadelphia and London W. B. Saunders Company 1906.

Volume II of this Atlas and Text book of Human Anatomy is equal in every way to Volume I which has been recently reviewed in the ANNALS OF SURGERY. Volume I treats of the anatomy of the bones ligaments joints and muscles while



Volume II is devoted entirely to the viscera, including the heart. Under this heading are included all the organs situated within the cavities of the body, so that the brain, spinal cord, heart, and even some of the organs of special sense, as the eye, are described under this designation. In treating the subject, the organs contained within the visceral tube of the body are grouped in three chief sub-divisions: (1) the digestive apparatus, (2) the respiratory apparatus, (3) the urogenital apparatus. Following out this sub-division, two particular constituents are recognized in each, viz., a tubular canal, and a series of non-tubular parenchymatous organs whose chief component constitutes the secreting epithelial substance of the glandular structures belonging to the individual apparatus. These are classified as sub-divisions. The volume is divided into a Treatise on General and Special Splanchnology, and a Treatise on General and Special Angiology. The volume is magnificently illustrated, the lithographs being true to life and not merely schematic, as is often the case in text-books and atlases of anatomy. The Anatomy and Text-book is a translation of the German edition by Dr. Johannes Sobotta, of the University of Wurtzburg, and is edited, with additions, by J. Playfair McMurrich, A.M., Ph.D., of the University of Michigan.

PAUL PILCHER

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A TEXT-BOOK OF HUMAN PHYSIOLOGY. By DR. ROBERT TIGERSTEDT, Professor of Physiology in the University of Helsingfors, Finland. Translated from the Third German Edition, and Edited by John R. Murlin, A.M., Ph.D., Assistant Professor of Physiology in the University and Bellevue Hospital Medical College, New York City. With an introduction to the English Edition by Professor Graham Lusk, Ph.D., F.R.S. (Edin.). Royal octavo, pp. xxxi, 751. New York and London: D. Appleton and Company, 1906.

The general excellence of Tigerstedt's "*Lehrbuch der Physiologie des Menschen*" and the high rank maintained by it as a medical text-book in Germany justify its translation, and for the labor involved in the undertaking Prof. Murlin de-

serves the gratitude of teaching physiologists in this country. This English edition is a somewhat abridged but otherwise faithful rendering of the third German edition the omitted portions being such as are not ordinarily included in the regular courses in physiology given in American medical colleges. Some additions have been made to the text by the American editor and a number of illustrations of simpler or improved forms of apparatus inserted. The exclusion of the section dealing with body movements though in accord with the common omission of that portion of the subject from our medical school courses in physiology is scarcely commendable. Its inclusion would have increased the size of the book by no more than fifteen pages and rendered it quite equivalent to the original work. Inasmuch as the mechanics of joints and of animal movements is of considerable practical value—especially to the surgeon and neurologist—its neglect by teachers of physiology in this country is rather surprising. Aside however from this defect—and perhaps but few will consider it a defect—the book is admirably suited for general use as a text book by medical students. The reviewer is aware of but one other text book in English that is likely to compete with it and of the two is inclined to give first place to Murlin's Tigerstedt.

J. C. CARDWELL.

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A TEXT BOOK ON THE PRACTICE OF GYNÆCOLOGY. For Practitioners and Students. By W. EASTERLY ASHTON, M.D., LL.D., Professor of Gynæcology in the Medico-Chirurgical College of Philadelphia. Third edition thoroughly revised. Philadelphia and London: W. B. Saunders Company, 1906.

The earlier editions of Prof. Ashton's work have already received reviews in this journal. Naturally the changes which have taken place during the year since its first appearance have not been extensive but supplementary material has been added and some revisions have been made. The metric system has been introduced. Microscopic examination and diagnosis of curettings from the uterus, the blood in relation to surgery, colonic lavage as a treatment of constipation, and the treatment

of vaginismus, are subjects which have been revised and rewritten. It is worthy of note that the superficial denudations for the cure of cystocele have been discarded and Dudley's method of operating has been substituted. The numerous methods for the correction of chronic retro-displacements of the uterus show the unsatisfactory results of our present operative treatment. The subject of gonorrhœa in the female has not received the consideration which it deserves and leaves the reader at a loss as to the best method for its treatment. The three editions within one year speak well for the popularity of the work.

PAUL PILCHER

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## HER MAIDEN EFFORT

A certain judge had been away from his native city for several years, and upon his return found it difficult sometimes to recognize former acquaintances. One morning a youngish woman, accompanied by a tall boy, entered the trolley car and sat down next the judge.

"How do you do, judge?" she said cordially. "I don't believe you remember me. I am Mrs. X."

"Why, so it is!" Mrs. X, I am delighted to meet you again. How do you do? And who is this with you? It can't be your son! Bless me, I would not believe you had a son so big."

"Oh, yes," replied the guileless Mrs. X, flattered by his cordiality. "He is my first-born—my maiden effort, judge."

—*July Lippincott's*

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—*July Lippincott's*

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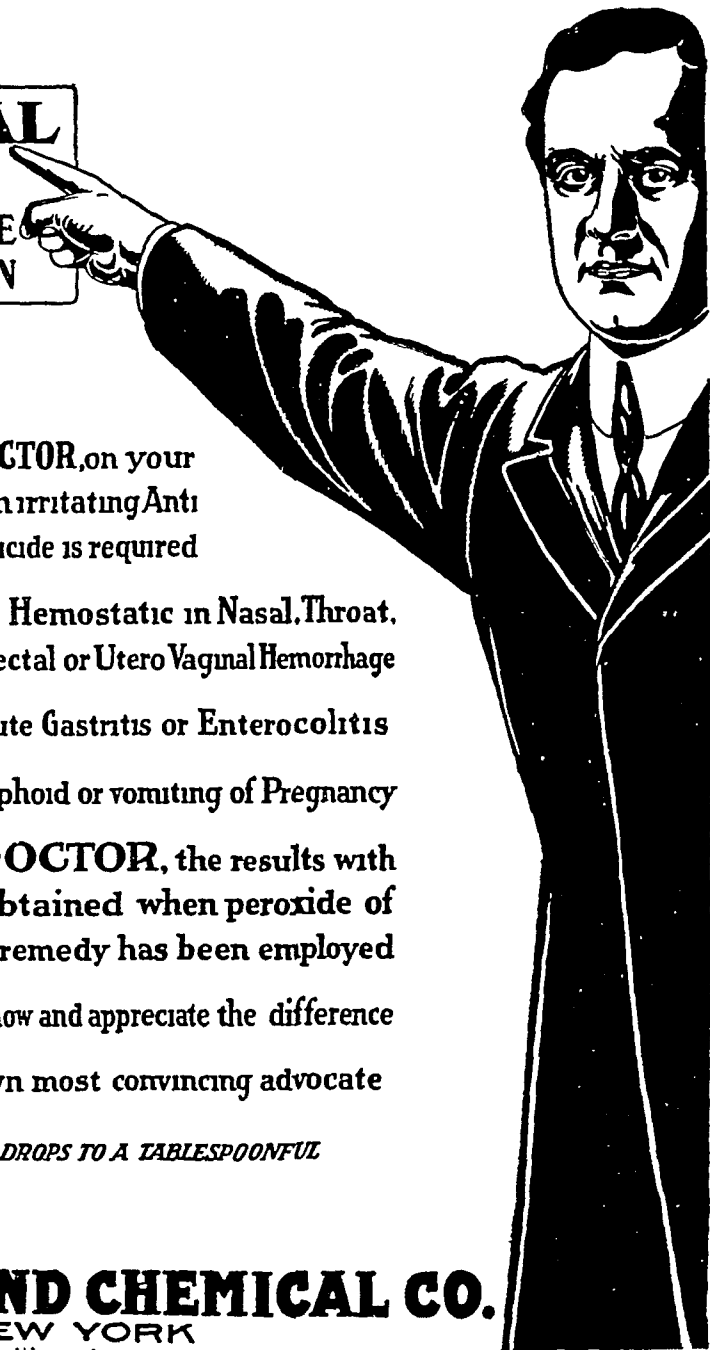
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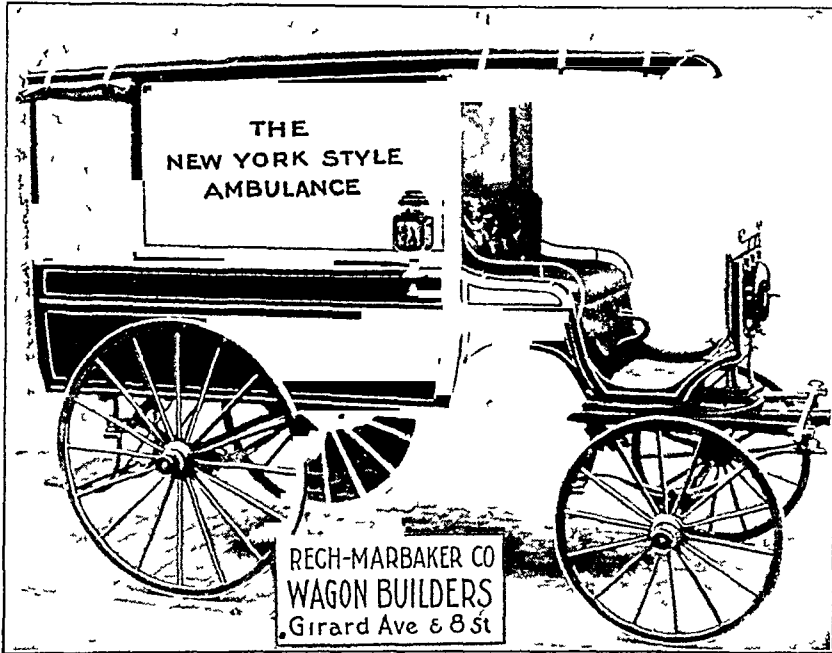
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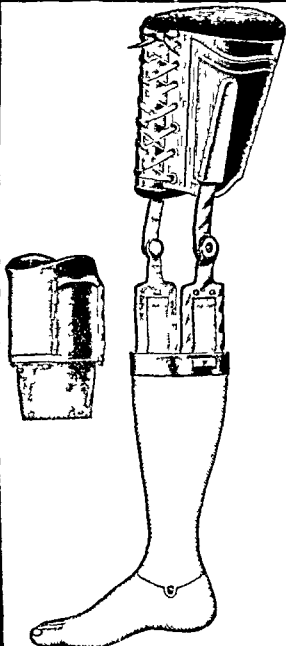
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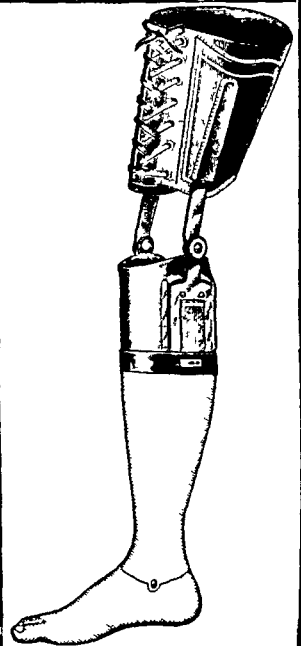
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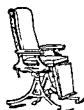
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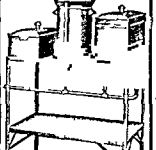
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# ANNALS OF SURGERY

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VOL XLVI

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## ORIGINAL MEMOIRS

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### AVULSION OF THE SPINE OF THE TIBIA

BY J HOGARTH PRINGLE M.B (ED) F.R.C.S

OF GLASGOW

S g t h R y l i f m r y

I AM not aware whether any report has yet been published of a case in which the tibial spine has been sutured to the tibia after its avulsion in fact as far as I have been able to discover there are only three instances of the injury on record those of Dittel of Poncet and of a patient admitted to University College Hospital London in 1873 In each of these cases the avulsion of the tibial spine was only discovered either after amputation or after the death of the patient

I am therefore induced to publish on account of the rarity of the condition the following notes of a patient whose tibial spine was sutured to the tibia

CASE I—A L aged thirty six years was admitted to the Glasgow Royal Infirmary June 14 1903 three days after having received a severe blow on the outer aspect of the left knee joint from the shaft of a cart. He was knocked down and thinks that the knee was knocked inwards He is a big powerful man The left knee greatly swelled from effusion into the joint cavity and there is a good deal of bruising of the superficial tissues The only abnormal movement is in the way of abduction of the leg at the knee This was so extreme that my house surgeon Dr A B Ross reported the case to me as one of probable rupture of the



internal lateral ligament of the knee, and, after frequent examinations of the limb with a constant failure to elicit any antero-posterior movement or any abnormal rotation of the leg upon the thigh, I rather inclined to this idea of rupture of the internal lateral ligament. The question of rupture of both crucial ligaments was gone into, although I was not at that time aware that any operative treatment had ever been carried out for that injury, but there seemed to be no evidence in favor of this particular condition.

On June 26 I exposed the internal lateral ligament, but found it apparently quite intact. Before incising the tissues, and when the patient was under anæsthesia, renewed attempts at movement of the tibia on the femur failed to produce any abnormal antero-posterior movement.

The joint was then opened into, the blood and fluid in it washed out, and it was at once seen that the anterior crucial ligament still attached to its bone insertion had been torn off the tibia and taken the spine with it, with a little trouble this was sutured, and the wound closed. He made a good recovery and has been seen several times since. He was brought before the Glasgow Medical Chirurgical Society, November, 1903, and was last seen September 3, 1905, when he said he had perfect confidence in the strength of the knee, it troubles him only a little at times when coming down stairs. There was the very slightest degree of abduction permitted when the joint was fully extended. At the right knee joint no lateral movement whatever was permitted while fully extended.

CASE II.—At the time the forementioned patient came under my care, I had seen once or twice a gentleman who first consulted me in October, 1902, on account of a looseness and feeling of insecurity of his right knee joint. He had been injured at football the previous March and thought he had received the violence on the outer aspect of the limb. The knee had been greatly swelled directly after the injury and was in splints for three weeks. Since then he had never had any feeling of security in the limb. When I saw him there was no fluid in the joint, but there was a remarkable looseness, so that it seemed to be possible to abduct the tibia, while extended on the femur, through 25 degrees, it was not possible to displace the tibia forwards or backwards on the femur nor to produce any abnormal rotation at the

knee The thigh muscles were much atrophied the circumference of the right thigh being 35 and of the left thigh 38 cm

In consequence of the absence of abnormal rotation and in fact any abnormal displacement of the tibia upon the femur other than the abduction I concluded the internal lateral ligament had been ruptured and that there was no evidence of injury to either of the crucial ligaments

The patient would not then consent to operation but in the following summer as he found no improvement taking place decided to have it and accordingly on August 6 1903 this was done When he was fully anæsthetized on manipulating the joint it was found that the head of the tibia could be brought forwards on the femur for about 2 cm (it had never been possible to do this previously) but no abnormal rotation could be brought about In consequence of this abnormal displacement forwards it seemed very probable that the anterior crucial ligament was ruptured but with so much abduction possible the original diagnosis of rupture of the internal lateral ligament as well seemed to be justified in spite of the experience of the last case The lateral ligament was therefore first exposed and found to be intact at any rate as far as its superficial fibres were concerned The joint was then opened and the anterior crucial ligament found torn from its femoral attachment This was sutured to the tissues on the external condyle and the joint closed

He made a good and uneventful recovery I saw him on July 29 1904 when he told me he had perfect confidence in the knee joint that he hunted ran to harriers and danced without any support to the joint There was the very slightest abduction possible The circumference of the thighs was right 40 left 40.5 cm

In August 1905 he wrote saying he had given the joint a severe wrench while jumping and that it became much swelled but I did not see him again until January 1906 when he told me he was able to golf run and dance again The circumference of the thighs was now the same 39.5 cm and the amount of abduction possible at the extended knee was only of the very slightest degree but there was a little

Although avulsion of the tibial spine is a rare injury there have been a few cases of rupture of the crucial ligaments published during recent years and some papers on the subject of

the mechanism of the injury have appeared. It may be worth while, therefore, to discuss the subject a little fully first of all from the point of view of the mechanism by which the injury occurs, and secondly from the diagnostic point of view.

The first patient to be operated upon was that of Battle. In this case both crucial ligaments were torn from the femur, and Robson recorded a case in which both ligaments were sutured after being torn "from their upper attachments."

Pagenstecher has recorded three cases operated on, in each of which one ligament only was ruptured—twice the anterior and once the posterior.

In consequence of their extraordinary strength, rupture of both crucial ligaments together can only occur as the result of very extreme violence and probably is associated always with gross injury to some of the other ligaments of the joint, and, more or less, complete dislocation, as was present in both Battle's and Robson's cases. I have had an opportunity of examining three knee joints which had been the seat of a recent dislocation of the tibia from the femur, both crucial ligaments had been torn in two of them, and in the third, the anterior crucial ligament was torn, but in all three there was extensive injury to some of the other (lateral or posterior) ligaments as well.

Regarding the rupture of one crucial ligament by itself, the matter is not quite clear, although many experiments have been carried out by Dittel, Pagenstecher and Honigschmied with the object of elucidating some points.

In Dittel's patient, with avulsion of the tibial spine, the injury took place apparently as the result of forcible separation of the tibia from the femur while the knee was in the flexed position, the patient died after the limb (the left) had been amputated (the nature of the injury was only discovered after dissection of the amputated limb), and on the cadaver, after prolonged attempts, Dittel succeeded in producing on the right knee the same injury by violence applied in the same manner.

Pagenstecher carried out a series of experiments and found that by flexing the leg forcibly over a large wooden bolster he

could rupture the anterior crucial ligament and that he could also do so by blows applied from behind to the upper end of the tibia while the knee joint was flexed (both processes similar to the supposed method of the accident in Dittel's patient & separation of the tibia from the femur) With blows applied to the upper end of the tibia from the front with the knee flexed he was able to produce rupture of the posterior crucial ligament and often with tearing out of the intercondyloid eminence Pagenstecher could only rupture the anterior ligament from its femoral attachment never from the tibial Honigschmied made a very large number of experiments on the cadaver regarding the effect of various extreme movements at the knee on the several ligaments of the articulation While he was able to rupture one or other crucial ligament and sometimes both in a varying proportion of cases by movement in any direction if carried out to excess he seems to have ruptured the anterior crucial ligament most constantly by hyperflexion tearing it from the femur and the posterior crucial ligament most constantly by hyperextension and tearing it from the tibia. (In both Battle's and Robson's case the two crucials were torn from their femoral attachments)

The question of rupture of these crucial ligaments has interested me a good deal and I have made some observations on the dead subject regarding the anterior ligament and the effect of its rupture upon the stability of the joint I find that provided the pelvis be fixed it is not very difficult to rupture the anterior crucial ligament by a combined movement of flexion abduction and internal rotation of the leg at the knee I think it is mainly the internal rotation which is effective and which is certainly more easily permitted when the joint is flexed than when it is extended but once laceration of the fibres is started the abduction no doubt plays an important role for with a knee joint flexed and rotated inwards if the anterior capsule be removed and slight abduction be made it can be seen that the anterior crucial ligament is tending to draw across the sharp internal margin of the external condyle at any rate in all my experiments the anterior crucial has only ruptured from its

femoral attachment, in this respect agreeing with Pagenstecher's results, and, I believe, that the draw across the internal border of the condyle by the abduction has some effect in leading to this result.

It appears to me to be quite possible that this combination of movements may have been the real mechanism of the injury in my two patients, certainly neither of them had the knee flexed over any object (in the manner of Dittel's and Pagenstecher's experiments), but both of them were of the opinion that they had been struck upon the outer aspect of the joint and that the knee had been knocked inwards, thus producing an abduction of the tibia on the femur, and it is conceivable that with such an injury the thigh and body of a patient might be swung round upon the fixed foot in such a manner as to cause an eversion of the thigh upon the tibia—equivalent to an inversion of the tibia on the femur. In further support of this idea, I may add that Pagenstecher states regarding his Case III that the knee "was knocked inwards" at the time of the accident, while his two other patients "fell upon the knee," and of the first of these he writes that when the patient was first seen the limb was in a position of "slight valgus" (abduction). He also says of his patients Cases I and II that there was easy mobility to each side permitted at the knee, but regarding his patient Case III he states definitely that there was no lateral movement possible.

In the examination of both my own patients the most remarkable feature to me was the extraordinary degree of abduction that seemed to be permitted at the knee (there was no adduction) while the leg was apparently fully extended, it was so marked that the first diagnosis in each case was that of rupture of the internal lateral ligament.

It is not just easy to see why there should have been so free abduction as was present in these two patients, but it is probable that it is due to a combination of causes. Dr Bruce Young has shown it is round the anterior crucial ligament, tightened up as it is by the extension of the joint, that the inversion of the femur takes place, as round a pivot, in the last move-

ment of locking the extended knee and it may be that with this important ligament ruptured and therefore unable to functionate the inversion and therefore the locking is incomplete and in consequence a degree of abduction may be permitted which is not possible in an intact joint for with an intact joint as long as the tibia is extended upon the femur no abduction is possible at all whereas if the knee be flexed to a very slight angle and the locking thereby be undone a certain degree of abduction becomes possible Still I do not believe that this explanation will account for all the abduction that was possible in my patients for I have divided this ligament a great many times upon the cadaver but have never been able to obtain the same degree of abnormal movement in this direction as was present in the patients but I observe if attempts to abduct the leg on the thigh are made when the anterior crucial ligament is divided that there is permitted a degree of internal rotation of the leg by which the swell of the calf of the leg comes to be more prominent at the outer aspect of the limb so that at first the impression is produced that a greater degree of abduction has taken place than actually was the case when completely extended there is only this rotation although a slight degree of abduction does take place if the knee be flexed

There is however another factor to be considered when I succeeded in rupturing the anterior crucial ligament on the cadaver I found on examining the ligaments of the joint that there was always a degree of tearing of the internal lateral ligament at its deep or articular aspect it never was complete it never involved that is to say the superficial fibres and none of the other ligaments of the joint ever showed any degree of injury With these short fibres of the internal lateral ligament ruptured it is not only possible but probable that a greater degree of abduction would be permitted than if they were intact.

Now in this connection it is worth recalling the statements of Pagenstecher regarding his patient Case I it was of this patient that he wrote that the knee after the injury was in a slight valgus position and with easy mobility to each side and at the operation the posterior crucial ligament was

found torn, the anterior was intact this is of interest, and, it seems to me, of considerable importance, for in a knee joint that is extended, the posterior crucial ligament ought not theoretically to have any effect whatever on the movements of the joint, for it is then in a state of relaxation According to all anatomists the posterior crucial ligament is only tightened in the flexed position of the joint, and, unless the deep fibres of the internal lateral ligament were also torn, it is extremely difficult to understand how the leg could be either in a position of valgus or permit easy mobility to each side as long as the knee was extended

Still with the injury as I have artificially produced it on the cadaver, *ie*, complete rupture of the anterior crucial along with rupture of the deep fibres of the internal lateral ligament and with the soft parts round the joint intact, I have never been able to get a degree of abduction at all comparable to that which was present in my patients

Experiments regarding the rupture of the knee joint ligaments have also been carried out by von Hints, who states with reference to the crucial ligaments, that "after division of one lateral ligament he divided a crucial ligament and found he could obtain lateral movement of the knee in the hyperextended as well as the extended joint, and after division of both crucials along with one lateral ligament he could bend the knee almost to a right angle," but I have never been able to obtain a lateral bending to this extent of any of the knees examined With the anterior crucial ligament alone divided through an incision exposing the interior of the joint, as for Kocher's method of resection and the soft parts otherwise intact, I find that if the knee joint be maintained extended there is no abduction permissible, whereas if flexed through about  $25^{\circ}$ – $30^{\circ}$  one can abduct the leg through about  $8^{\circ}$  at most But if in addition the internal lateral ligament be divided and the knee flexed through  $25^{\circ}$  or  $30^{\circ}$  one can then abduct the leg through  $15^{\circ}$ , but the abduction may appear to be rather more if one does not discount the internal rotation which, as already mentioned, tends to occur

Through the kindness of Dr T H Bryce I had an opportunity of examining at Queen Margaret College the ligaments of the knee joints of some dissecting room subjects with all the soft parts removed and here with both crucials along with one of the lateral ligaments divided the greatest degree of lateral movement I could obtain was 70 very much greater than I could get in any joint which had the surrounding soft parts intact though considerably less than that obtained by von Hints

The diagnosis of these injuries is not always easy In the case of rupture of both crucial ligaments it is probable that antero-posterior movements of the tibia on the femur will always be abnormally free and this should suggest the possibility of this injury but in my two patients I never could produce this abnormal movement except in the second case and then only when the patient was anesthetized although it had been examined for on several occasions as the question of rupture of one or other of the crucial ligaments had been discussed several times One would on theoretical grounds expect that with rupture of the anterior crucial ligament alone the head of the tibia would be permitted to come forward in manipulation and that with rupture of the posterior crucial the tibia could go backwards on the femur in the flexed position of the joint in which position alone the posterior crucial is tense Von Hints however states the direct opposite and quotes Dittel in support of his statement but it is obviously altogether erroneous

I am inclined to think that with an injury to a knee joint resulting in distention of the cavity with blood provided no other lesion were obviously present it might suggest injury to one or other of these crucial ligaments or to the tibial spine. If internal rotation of the extended leg were permitted at the knee or if the head of the tibia could be brought forward on the femur it would point to the anterior crucial or tibial spine as the seat of the injury and perhaps an abnormal adduction would also The one sign of rupture of the posterior crucial ligament alone should so far as I can see be the possibility of displacing the head of the tibia backwards while the knee joint



is in the flexed position    Abnormal abduction of the leg on the femur, I am inclined to attribute to rupture of, at any rate, the deep fibres of the internal lateral ligament

Probably, however, in many instances the real nature of the injury will only be accurately determined by an exploratory operation, which is certainly called for in every case of instability of a knee resulting from accident, for an unstable, loose knee joint is useless for the support of a patient's weight, and in the few cases that have hitherto been treated the results of suturing the tibial spine or crucial ligaments have been very satisfactory

Pagenstecher has suggested for this injury the term "internal distortion" of the knee, which appears to be altogether unnecessary, and is certainly not exact, whereas the terms "Avulsion of the tibial spine" and "Rupture of the crucial ligaments" label the nature of the injuries as precisely as can be desired, and they require to be kept distinct from one another, for one is a fracture of bone and the other is not

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# OSTEOGENESIS IMPERFECTA AND IDIOPATHIC FRAGILITAS OSSIUM

BY CHANNING C SIMMONS M D

OF BOSTON MASS

ABNORMAL idiopathic fragility of the bones as a definite disease has been recognized for many years and the condition has been described more or less perfectly by many observers. The disease may be divided into two main groups (1) symptomatic fragilitas ossium in which the abnormal fragility of the bones is due to some local or well recognized general condition and (2) the idiopathic form often termed osteopsathyrosis.

Symptomatic fragilitas ossium due to local conditions is seen following bone tumors such as sarcoma metastatic cancer bone cysts and most markedly in multiple myeloma or sometimes as the result of inflammatory processes as osteomyelitis or gumma. It is seen also in certain general systemic bone diseases as rachitis and osteomalacia. It is said to occur in congenital syphilis but there is some doubt whether syphilis except in the form of a gumma ever affects the bones sufficiently to cause fracture. In certain nervous and mental diseases abnormal fragility of the bones is known to occur fractures being caused by the slightest violence. This is marked in insanity and tabes and in these cases as pointed out by Charcot it is probably due to a trophic disturbance. Pathological fractures have been reported occurring in cases of scurvy and they are not uncommon in the aged where they are due to the osteoporosis of old age. The above mentioned causes of abnormal fragility are well recognized and the condition itself is of relatively minor importance.

Comparatively little on the other hand is known of idiopathic fragilitas ossium and the etiology of many of the cases is still obscure. It was first differentiated from

osteomalacia and the symptomatic forms by Lobstein<sup>2</sup> in 1883, who suggested the term osteopsathyrosis for the condition, and it has generally been known by this name since, or as periosteal dysplasia (Schuchardt<sup>3</sup>) It may be defined as a condition of macroscopic and microscopic osteoporosis of unknown cause, producing a fragility of the osseous system, resulting in multiple fractures Gurlt<sup>4</sup> in 1862 wrote a classical article on the subject, and since then many articles have appeared, among which may be mentioned those of Schultz,<sup>5</sup> Linke,<sup>6</sup> Griffiths<sup>7</sup> Schuchardt, Biggs,<sup>8</sup> Trendelenberg,<sup>9</sup> Nathan,<sup>10</sup> and Broca and Herbinet<sup>11</sup> Griffiths collected from the literature 57 cases, several of which, however, are probably not true idiopathic fragilitas ossium

The following two cases were treated in the wards of the Massachusetts General Hospital, and are reported through the courtesy of the physicians in whose services they occurred

CASE I—Service of Dr A T Cabot Female, 13, single Massachusetts General Hospital No 145,787 December 30, 1905

*Family History*—Mother and father well None of her relations have been subject to fractures One brother, 11 years old, perfectly well No evidence of syphilis in the family

*Previous History*—Chicken pox and whooping cough, but otherwise always well She has had fractures as follows

(1) At birth, right humerus, (2) at five years, right femur just above condyles, (3, 4) between five and eight years, broke left lower leg at about centre twice during these three years, but does not remember exact dates, (5) at eight years, broke left tibia again at about same place, (6) at twelve years, hit elbow and "sprained it," no pain in particular, and no treatment, X-ray shows a fracture of the olecranon, (7) three months ago, broke left tibia at about same place for fourth time, (8) December, 1905, broke right femur above condyles, (9) February, 1906, broke left femur above condyles

Of the earlier fractures she does not remember a great deal Fracture No 5, the third fracture of the left lower leg, was caused by a fall, but the mother says it appeared as if the fall were in

consequence of the leg breaking instead of the fracture being caused by the trauma. Fracture No 7 occurred three months before her admission to the hospital and happened in the same manner. When not recovering from fractures the child has attended school, played with other children and has been in every way normal. She has been in bed since September 1905 recovering from fracture No 7 and previously to that she had worn a leather brace on her left leg. The fractures as well as she can remember have been accompanied with the classical symptoms to a greater or less extent but pain and swelling have never been marked. The lack of pain is well illustrated in fracture No 6 the olecranon which caused so little inconvenience she did not seek treatment.

At birth she was a healthy baby and nothing abnormal was noticed the fracture of the humerus occurring at delivery being looked upon as an obstetrical accident. Her appetite has been normal and her diet that of well to do country people and the same as the rest of the family.

*Present Illness*—Last night was awakened by a sharp pain in her right thigh which on examination proved to be due to a fracture of the femur.

*Physical Examination*—Head large and square. Posterior fontanelle depressed two inches in diameter and soft but no pulsation felt. Anterior fontanelle closed. Poorly developed and pale. Pupils equal and react to light. Throat and mouth normal. Heart and lungs and abdomen not remarkable. No rachitic rosary. Right arm shows slight bowing at lower third of the humerus. The elbow shows an old fracture of the olecranon with considerable separation of the fragments but no limitation of motion or other functional disability. Left arm normal. Right lower leg shows anterior bowing at the junction of the lower and middle third with some motion (fracture No 7). Right femur shows a fracture at the junction of the middle and lower third with crepitus abnormal mobility etc. The radiograph shows an irregular fracture not transverse with little displacement. Epiphyses throughout the body normal.

Fracture put up under ether in Buck's extension with Desault and coaptation splints. On February 14 1906 the Buck's extension was removed and union being firm the leg was put up in a plaster spica.

On February 15, at 5 A M, the patient woke up with a sharp pain in her left leg, and on examination a fracture was found just above the condyles of the left femur. The fracture was treated as the other had been. On March 16 the spica was removed from the right leg, and union found solid.

On April 1 there was fair union in the left femur, and the leg was put up in a plaster spica.

*Urine*—December 31, 1905. Pale, cloudy, acid. Specific gravity 1033. No sugar or albumin.

April 3, 1906. Amount in 24 hours 1350 cc. Color pale. Reaction acid. Specific gravity 1007. Urea, 1.13 per cent, 15.25 grams, uric acid, 0.33 per cent, 45 grams, chlorine, 267 per cent, 3.60 grams, phosphoric acid, 0.81 per cent, 1.29 grams, sulphates, 0.12 per cent, sugar, 0, albumin, very slight trace, sediment, not remarkable.

This specimen shows a dilute urine, although the patient had been on extra diet and tonic treatment for nearly two months. The sulphates particularly are considerably diminished, the normal being about 2 per cent. The proportion of uric acid to urea is high.

April 18. Amount in 24 hours 720 cc. Color normal. Reaction acid. Specific gravity 1020. Urea, 3.15 per cent, 22.6 grams, uric acid, 0.7 per cent, 5 grams, chlorine, 503 per cent, 3.6 grams, phosphoric acid, 1.5 per cent, sulphates, 1.25 per cent, sugar, 0, albumin, very slight trace, sediment, not remarkable. This specimen is practically normal.

A description of the radiographs taken during the month of March is as follows.

*Head*—A lateral view only was taken, which shows its peculiar shape, but nothing abnormal about the bones could be detected.

*Upper Extremities*—An X-ray of the right shoulder showed the ribs, clavicle, and scapula normal. The humerus also appeared normal, except near the head, where there was some thinning of the cortex, and evident diminution in the lime salts in the central portion of the bone. The shaft cast a dense shadow, and the relation of the cortex to the medulla was normal. The radius and ulna (Fig. 1) were also normal, except that the upper extremity of the latter bone had somewhat the same appearance as the head of the humerus, although in a less degree, and there was



C I → R ght rm Th h ft f th bo m l b h head f th l ca t  
m hat f t h d w h l U lt d f t f h leera

FIG 2



Case I—Hand







an ununited fracture of the olecranon. The bones of the hand cast a somewhat fainter shadow than would naturally be expected and the first phalanges were extremely long (Fig 2)

*Lower Extremities*—X rays of the thighs showed the upper parts of the bones normal. On the right there was an oblique fracture 4 inches and on the left a transverse fracture 3 inches (Fig 3) above the epiphysis. The epiphyses about the knee were normal. From above the points of fracture to the ends the bones cast a comparatively faint shadow, the appearances not being due to a high tube but apparently to a lack of bone substance. The cortex was thin in the lower third of the bones and the medulla proportionately larger. The widening of the medullary cavity was more marked and abrupt on the right than on the left (Fig 4). The fibulae were small.

The tibiae had at their upper and lower extremities a similar appearance to the upper end of the humerus and lower end of the femur and the appearance might be said to be somewhat similar to the changes seen after long immobilization of a limb in cases of prolonged tubercular bone disease. Some deformity from the old fractures could be seen in the shafts. Nothing comparable to a localized bone disease could be seen in any of the bones.

The patient received while in the hospital general tonic treatment. She was put on extra diet and was given cod liver oil and eisen-zucker. During January she received small doses of thyroid extract three times a day but this was later discontinued and a syrup of manganese substituted.

CASE II—Service of Dr H A Towle. Female ten months. Entered the skin ward of the Massachusetts General Hospital May 31 1905.

*Family History*—Father and mother well. One sister four years old and a brother two and a half years old perfectly well.

*Previous History*—At birth nothing abnormal was noticed and for the first nine months the child was healthy and took nourishment well. One month before admission began to lose weight and developed a skin eruption. The parents Syrians never noticed anything unusual about the bones.

On admission to the hospital the diagnosis of dermatitis was made and the child treated accordingly with good effect but about July 1 she developed a chronic bronchitis from which she died July 15.

*Abstract of Autopsy*—July 16, 1905 Dr Oscar Richardson Anatomical diagnosis Purulent bronchitis, anæmia, œdema of piæ, multiple fractures, osteoporosis The body was that of a female child, much emaciated, 62.5 cm long

*Head*—Anterior fontanelle open, posterior nearly closed Pia moderately infiltrated with thin clear fluid Vessels normal Nothing remarkable about the brain or cord

*Trunk and Extremities*—The epiphyses of the long bones were slightly enlarged The shafts of the long bones of the extremities showed deformity and multiple fractures On section the bones cut easily with the knife, and the distribution of the cortical bone was uneven, it being in many places entirely absent In no bone was it of normal thickness The medullary cavities were large and filled with soft red marrow There was little subcutaneous fat, and the muscles were pale

Digestive tract and abdominal organs normal Pleura smooth Heart normal The mucous membrane of the trachea and bronchi was red, thickened and bathed in considerable yellow purulent material No areas of consolidation were found in the lungs

*Microscopic examination* of sections from several of the bones showed practically the same condition The cortical bone was thin, and the medullary cavity proportionately large, while the periosteum was thick and fibrous The Haversian canals were large There seemed, however, to be a normal number of osteoblasts, and but few osteoclasts were seen in an examination of several sections The marrow was not remarkable, and contained fat, myelocytes and giant cells in normal proportions In other words, nothing abnormal was noted except a lack of bone A section through an epiphysis showed the cartilage forming bone in the usual manner.

Radiographs were taken post mortem, and showed from one to four fractures of each of the long bones of the extremities (Fig 5) with some displacement These fractures were nearly all transverse The clavicles were normal, as were also the ribs

The bones all showed the same condition The cortex was extremely thin, and in places seemed to be absent, and the bones cast a faint shadow, which was evidently due to a lack of lime salts The general appearance of the bones was similar to that in Case I





Lobstein who first separated the idiopathic variety from other forms of fragilitas ossium described it as a concentric atrophy of the bones with enlargement of the marrow cavity and thinning of the cortex. Gurlt on the other hand considered the bones normal but delicately formed. Charcot, Bruns and Broca and Herbinet consider it a trophic disease the lesion being situated in the anterior roots of the spinal cord and this theory has had considerable weight on account of the similar condition known to occur in certain nervous and mental diseases—in fact it is the generally accepted explanation. Other observers have considered it caused by disturbed innervation of the arteries of the bone. Schuchardt and more recently Nathan have advanced the theory that the disease in young subjects is identical with osteogenesis imperfecta. Many authors consider the disease osteogenesis imperfecta incompatible with extra uterine life but although it is a fact that most of the cases are born either prematurely or dead certain others which are not of an extreme type undoubtedly live (Case II). Nathan reports two cases in which abnormal fragility was present at birth both cases living. Zeigler<sup>12</sup> believed the disease of pure congenital origin due to some malformation of the primary bone cartilage.

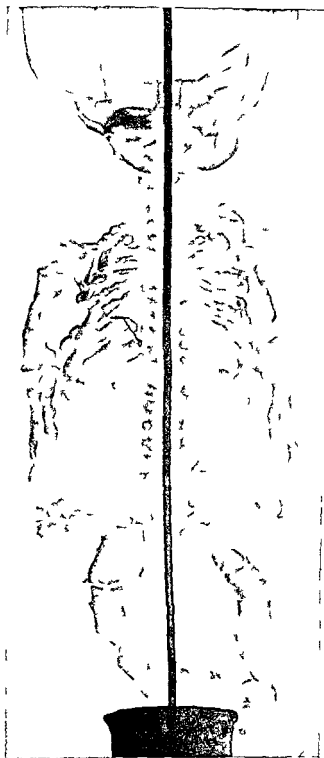
These two cases undoubtedly represent cases of osteogenesis imperfecta which have lived and have no relation to trophic disturbances. The general appearance of Case I at birth was not remarkable but although the delivery was easy the *right humerus* was fractured. The fact that no other fracture occurred until the age of five does not entirely eliminate osteogenesis imperfecta as it is conceivable that the condition may have been present in a mild degree in fact the number of fractures is not nearly as great as in many of the reported cases. The chief points at present in this case which suggest a congenital origin for the disease are the shape and size of the head which is similar to that of rickets and the fact that the posterior fontanelle is open and it does not seem possible that trophic disturbances having their seat in the anterior horns of the spinal cord could affect the bones of the skull or prevent

the fontanelle from closing It is unfortunate, as Nathan has pointed out, that the condition of the fontanelles in the reported cases is rarely mentioned There was not the slightest evidence of syphilis or rachitis in this case

Case II is similar to Case I in many respects, but the disease is, of course, much more marked If the two diseases are phases of the same condition, the cause is the same—that is, the theory of disturbance of the primary bone cartilage combined with inability of the epiphyseal cartilage, or periosteum, to form normal bone, as has been shown microscopically, is probably the correct one The histological appearances of the bone in the two types should, however, be compared carefully, but unfortunately this is almost impossible as adults rarely die of the disease, and will account for most of the cases of idiopathic osteopsathyrosis

Biggs and many other observers recognize two forms of the disease, one occurring in early life, of which the above cases are the type, and the second occurring in adults This adult form may on further research prove to be identical with that seen in young people, but it is probably an entirely different disease, possibly of trophic origin Cases where deformity or bending occurs before fractures are not true cases of idiopathic fragilitas ossium An hereditary tendency in many of the reported cases has been marked, the disease being transmitted through either parent, and in this respect it is similar to multiple cartilaginous exostoses—a disease of the epiphyseal cartilage, or in some cases of the primary bone cartilage (Lippert<sup>13</sup>) Greenish's<sup>14</sup> case is a marked example of the hereditary tendency

|        |   |                   |   |                       |
|--------|---|-------------------|---|-----------------------|
| Father | { | Son, 2 fractures  | { | Son, 2 fractures      |
|        |   | 3 normal children |   | Son, 2 fractures      |
|        |   |                   |   | 3 normal children     |
|        |   | Normal son        |   | Son, 8 fractures      |
|        |   |                   |   | Son, 3 fractures      |
|        |   |                   |   | Son, 4 fractures      |
|        |   |                   |   | Son, 4 fractures      |
|        |   |                   |   | Son, 4 fractures      |
|        |   |                   |   | Daughter, 3 fractures |
|        |   |                   |   | 4 normal children     |



O t g      Impe f t      Rad graph f      k l t      f      ll born f      h w l g  
                  f red bly l g      mbe f fract re      (W rren M      m)





All the bones of the body including the cranium may be involved to a greater or less extent but the femur probably on account of its position is most commonly fractured next in order coming the bones of the leg and arm

*Symptoms*—The symptoms consist of repeated fractures occurring as the result of insignificant violence or muscular exertion but are not rarely spontaneous They may occur with great frequency Blanchard<sup>15</sup> having reported a case with 106 (Fig 6) The bones may break while the patient is simply standing erect and it is not uncommon for the patient to awake in the night with pain in the leg to find a fracture as in Case I Other than the tendency of the bones to fracture the subjects are usually in perfect health if they survive the first few years of life

The symptoms are the same as those of fractures occurring in normal individuals but differ somewhat in degree Pain is usually less and may be insignificant as illustrated in Case I by the patient considering the fracture of the olecranon as a slight sprain Crepitus is said by many to be soft but in this case at least did not differ from that of any fracture Union is usually rapid with but little callous formation but may be delayed The deformity is not due to bending of the bones as in osteomalacia or rickets but in all true cases to a faulty reduction of the fracture and is most marked in the severe cases the patient becoming resigned to the fact that his bones fracture easily and not seeking treatment but using the limb before the bony union is solid

*Pathology*—Few of the cases if they survive the first few years of life die of the condition itself so complete autopsy reports are uncommon Nothing distinctive has ever been found in the bones however the condition being a simple osteoporosis resembling that seen in other diseases and that of osteogenesis imperfecta The marrow cavity is larger than usual and the cortex correspondingly thin Microscopically the trabeculae are thin and there may be an increased number of osteoclasts while the osteoblasts are diminished The marrow may be normal or may contain an increased amount of

fat The canals are also said to be dilated Thus there is a true osteoporosis with a reduction in the amount of bone by dilatation of the marrow spaces and canals similar to the form seen in old age or occurring after disease Chemical examination of the bone shows it to contain a normal proportion of lime and other salts in contradistinction to the bone in osteomalacia, in which there is a diminution of the salts, the bone being replaced by fibrous and osteoid tissue

*Diagnosis*—The diagnosis is made on the symptoms of repeated fractures occurring either spontaneously or after slight violence, other causes of multiple fractures, such as tabes or multiple bone tumors, having been eliminated by the examination and the X-ray

*Prognosis*—The prognosis is on the whole rather unfavorable The mortality in the first few months of life is extremely high, but in the milder cases there has been a distinct tendency as the child reaches puberty for the bones to become more normal, and the liability to fracture ceases, although in other cases the fractures have occurred with increasing frequency In those cases where the condition has occurred in adults, there may be a spontaneous cure, or the disease may progress from bad to worse Ultimate deformity is almost sure to occur

*Treatment*—The treatment directed towards the cure of the disease is unsatisfactory, no drug having any effect Calcium and phosphorus salts have been largely given in the hope that they would be deposited in the bones, thus strengthening them, but although cases treated in this way have recovered, there is no proof that the cure had any relation to the drugs given Thyroid extract has been recommended, and largely used, but apparently with little benefit The patient should be given general tonic treatment in the way of good food, cod liver oil, iron, etc., and kept in the best hygienic surroundings

What is more important than the general treatment in the present state of our knowledge, is the prophylactic treatment The patient should be warned of the liability to fracture and protected in every way from violence Leather or steel braces

may be worn adapted to the individual case to protect the legs and thighs. When fractures do occur they should be treated as usual and the greatest care observed as to the position to obviate any unnecessary deformity.

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## TRAUMATIC EPITHELIAL CYSTS

BY LEO BUEGER, M D,

OF NEW YORK,

Surgeon to the Good Samaritan Dispensary, Assistant in Pathology, Mt Sinai Hospital

*Historical*—This name was given by Garrè to the small epithelial cysts which usually occur on the volar surface of the hand and fingers, and which in his opinion regularly owe their origin to some trauma. Gros and Reverdin were the first to suggest this mode of origin, but it was not until Garrè's paper appeared that careful studies with a view to clearing up this point were made.

According to the usual descriptions, these cysts are small, round or oval tumors, varying in size from a lentil to a walnut or even larger, and are covered by non-adherent skin, which may be normal or present a tiny scar. They are composed of a cyst wall which is easily separated from the surrounding structures, and contain white atheromatous or pultaceous, semi-solid material. The cyst wall is made up—from without inward—of a layer of connective tissue, then of cuboidal and polygonal epithelial cells, which become gradually flattened in the succeeding layers until finally the innermost strata shows only cornified epithelium. Desquamated horny epithelial cells, granular detritus and at times cholesterol crystals fill the interior of the tumor. In short, we have the usual elements of the epidermis, surrounded with connective tissue, but arranged in inverse order so that the stratum corneum is innermost and furnishes the material for the cyst content.

It is because they present features so similar to those of the ordinary sebaceous cyst that the older German authors called them atheromatous cysts. However, their situation in parts wholly devoid of sebaceous glands and the nature of their content made it soon evident that some other reason for their occurrence must be sought. Later, they were regarded as dermoids because of their general characteristics and their

epithelial nature. Against this view the following important points were adduced: they were not observed in children rarely in adolescents and the usual elements—hairs, teeth, glands, sebaceous material—found in dermoids never occurred. And thus from considerations such as these and from clinical and microscopical study it became generally accepted that they

F



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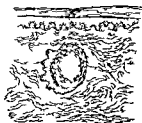


Ep derm h gr w d w l p  
d g (Af G rr )

were purely epidermal structures whose origin could be explained in but two ways: either by the traumatic theory or the theory of foetal inclusion.

The advocates of the traumatic theory think that in the course of an injury such as a puncture, the introduction of a foreign body, or a lacerated wound, a portion of the surface

F 3



Ep th l C y t m p l t (Af G rre.)

epithelium, with or without its nourishing vessels, becomes detached and is deposited in the subcutaneous tissues, where it continues to grow and finally forms a cystic tumor. Garre has depicted the process diagrammatically in his paper, and his figures have been reproduced here (as Figs 1, 2, and 3). It will be seen that the displaced epithelium continues to grow

in breadth and in thickness. Encountering considerable resistance on all sides, it is forced to curl up, and as it continues to do so, forms a globular structure which is finally converted into a complete sphere. The cyst continues to grow by virtue of the activity of the epithelium, which is constantly pouring cornified epithelium into its interior.

Sufficient clinical and experimental evidence has been presented in the last few years to give great weight to the traumatic theory. Woerz in his reviews of 55 cases finds that 24 gave a distinct history of trauma. Most of the injuries were in the nature of punctured wounds, in one instance a blow with a hammer was held responsible, and in three instances the formation of the cyst followed a panaritium. More recently, Pietzner has collected 73 cases from the literature. In 43 of these trauma is given as the cause, the following various forms having been noted: dog bite, blow with a hammer, incised wound, penetration of a piece of wood, punctured and contused wounds.

Although these data are suggestive, they alone would not be convincing were they not strengthened by experimental observations. Kaufmann in an interesting piece of work showed conclusively that detached, buried epithelium could give rise to so-called atheromatous cysts. His method, which he calls "Enkatarrhaphie," was to separate off an elliptical island of the skin of the cock's comb by clean cut incisions, and then to bury it by suturing the margins of the wound. After a few days the little island of epithelium increased in size, its edges began to turn up, and finally veritable cysts filled with atheromatous masses composed of cornified epithelial detritus were produced. Manasse and Schweninger showed that the detached epithelium need not necessarily be connected with its blood-vessels. The former, experimenting with dogs, found that pieces of epidermis could proliferate when introduced under the skin, or fascia, or even into tendon tissue.

Of interest in this connection is the observation made by von Kummer, who saw an epithelial cyst form about the point of a needle which had been buried in the tissues. Neugebauer

cites a case of neurolysis for cicatricial compression of the musculo-spiral nerve. After two unsuccessful operations the nerve was freed and surrounded by an epidermal graft with a view to the prevention of vicious adhesions. A sinus soon developed and out of it a pulaceous white detritus was evacuated. It was doubtless a case of a partially formed epithelial cyst.

Finally it has been observed that the great majority of the cases occur in men who because of their work are much more exposed to traumatism than are women. But 7 of the 55 cases collected by Woerz were found in the female.

In support of the other view, that these cysts are congenital in origin, we have the publications of Franke, who although one of the first to recognize their true histological nature is now generally believed to be wrong in his contention as to their causation. Claiming that they were due to foetal inclusion, he nevertheless conceded that a traumatism might be instrumental in stimulating their sudden development.

Epithelial cysts also occur in the iris, and Masse was able to produce these experimentally by implanting squamous epithelium. Sutton has aptly termed them implantation cysts and they are frequently called by that name.

Woerz and more recently Pietzner have summed up the main clinical features. The former collected 55 cases, the latter 73 cases from the literature. From Pietzner's review the following conclusions may be drawn. The period of time which elapses between the trauma and the development of the cyst may vary from one month to twenty-four years. In 68 of the cases the cysts occurred on the hands. But 10 cases were females, 63 males. Most of the tumors were found on the flexor surface of a finger. Forty-three patients gave a history of traumatism. The size of the cysts varied from a hemp-seed to that of a pigeon's egg or even larger. He also questions the validity of Franke's theory as to their embryonal origin from a consideration of his own cases and of the majority of the cases reported.

*Own Observations*—I wish to contribute three further



examples of this condition to the literature, because of certain points of interest that were observed and because traumatism was undoubtedly responsible for the production of two of the cases

CASE 1—J M, male, January, 1907, seen in Dr Walter Brickner's<sup>1</sup> department, Mt Sinai Hospital Dispensary About two months ago he pricked the index finger of his left hand with a sharp nail He paid no further attention to this slight injury For the past four weeks he has noticed a little growth at the site of former injury This has become progressively larger and causes him inconvenience rather than pain

*Examination*, January 14, 1907—Upon the palmar surface of the last phalanx of the left index finger, about at its middle, a small pearly white hemispherical tumor rises abruptly from the surrounding parts It measures 4 mm in diameter, has a glistening surface not unlike that of some white vegetable fabric (Fig 4 Owing to this peculiar appearance, its true character was not at once recognized, indeed it closely resembled the small parasitic cysts that are so frequently seen in animals It was easily removed by grasping its protruding portion with a forceps and pulling it out of its bed in the tissues During this manoeuvre its fragile envelope was torn and a white granular cheesy substance, the cyst content, escaped

*Pathological examination*—The cyst is ovoid and measures 4 by 7 mm Its outer surface is perfectly white, smooth, and glistening Its wall is homogeneous in character throughout and about the thickness of the ordinary epidermis It is completely filled with a white pultaceous material not unlike the contents of a sebaceous cyst

Microscopical examination showed a cyst wall composed of two layers the outer made up of squamous epithelial cells, the inner being a cornified lamellated stratum Fig 5<sup>2</sup> shows a cross section of the cyst with its contents in situ The structure is similar to that of ordinary epidermis with its layers inverted, except that its elements show evidences of the effect of pressure and atrophy The cells of the rete mucosum (stratum Malpighi)

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<sup>1</sup> I wish to thank Dr Brickner for his kindness in allowing me to study this case

<sup>2</sup> I wish to thank Dr F S Mandlebaum, Director of the laboratory, for the preparation of the photomicrograph

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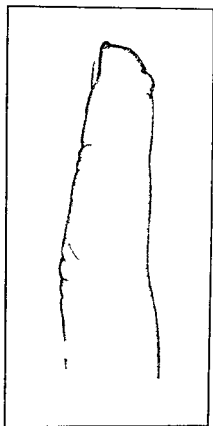
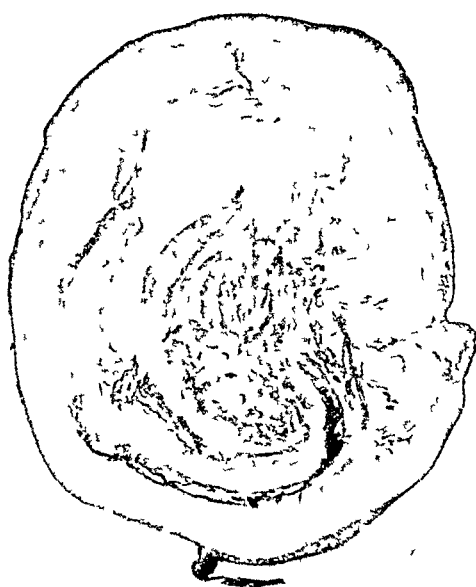


FIG 5



are small and atrophic very much flattened and the stratum granulosum presents long fusiform cells evidently under considerable pressure. There is no definite stratum lucidum but a thick layer the stratum corneum blends with the contents of the cyst. This is composed of desquamated horny cells and detritus.

The unusual feature observed in this case is the fact that the cyst was nowhere covered by normal epidermis and was lying partly without and partly within the tissues. It is difficult to imagine the exact mechanism of its production. Perhaps the displaced epithelium in this case was not carried in very deeply and was covered when healing took place by but a thin layer of epidermis. Then as the cyst increased in size and as its contents began to distend its walls this thin covering of normal epidermis by virtue of the pressure from within gave way and allowed the cyst to protrude beyond the surface of the skin.

CASE 2 is interesting because the mode of development could be observed.

J. K. male 13 years came to the Good Samaritan Dispensary (January 20 1907) in order to have the point of a needle removed from the pulp of the left index finger. A small incision was made and the needle point about one eighth of an inch long was removed. The wound healed by primary union. On April 8 the patient returned complaining of the presence of a little hard spot on the same finger which he said refused to heal.

Near the tip of the palmar surface of the left index finger at the site of the old incision there is a tumefied area about the size of a split pea. The skin over it is thickened and at its most prominent part presents a tiny opening too small for the entrance of a small surgical probe. On pressing upon the neighboring skin a white granular substance escapes from the opening.

Under cocaine anæsthesia the little tumor was circumscribed by an oval incision and excised. A section was made through the mass and the opening found to lead into a small cyst about 4 mm in diameter and filled with a white granular cheesy material.

Microscopic examination showed that the cyst wall was com

posed of normal epidermis whose cornified layer was greatly increased in thickness. The opening on the surface measured less than 1 mm. Here the epidermis could be traced directly into the lining of the cyst. The contents were desquamated and degenerated cornified epithelial cells.

Here again we have an atypical case. Whether the channel which allowed the escape of the cyst contents was secondarily established by traumatism, or whether the displaced epidermis had not been completely detached by the trauma, is an open question. Either one or the other theory could explain the condition.

CASE 3 differs from the other two in that no history of traumatism could be obtained, and is remarkable because of the situation of the cyst.

F. K., female, 39 years, was treated by me at the Good Samaritan Dispensary for chronic mastitis. Under the skin of the breast, near the axillary fold, a pea-sized indurated area began to make its appearance whilst she was under treatment. After a period of 2 weeks had elapsed, the mass became adherent to the skin, the latter became reddened and painful. Owing to the peculiar situation of this indurated area and the fact that similar inflammatory nodules had been previously removed from the breast (with a view at that time of establishing a diagnosis of tuberculous inflammation<sup>3</sup>), I excised the little tumor with a sufficient amount of healthy skin. The wound was sutured and healed by primary union.

*Pathological Examination*—Upon section there is a small abscess cavity about 1 cm. in diameter, filled with thick mucoid pus. It lies 0.5 cm. below the skin. The wall of the abscess is composed of squamous epithelial cells arranged in a manner closely resembling that of the epidermis. Externally there is connective tissue, with evidences of acute and chronic inflammation. Then there are a number of layers of squamous epithelial cells which become cornified as we approach the inner strata and finally there is an inflammatory exudate composed of fibrin and

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<sup>3</sup> I have since concluded, from the pathological examinations, that we were dealing with a case of multiple gummata of the breast.

polynuclear leucocytes. In the inflammatory zone surrounding the wall of the cavity there are many giant cells of the foreign body variety. The epithelial layers are infiltrated with round cells and polynuclear leucocytes.

We were evidently dealing with a small epithelial cyst which had become infected.<sup>4</sup> Lying in the loose subcutaneous tissue near the axilla its presence was not discovered until by virtue of the inflammatory exudate externally and into its interior it became adherent to the skin and palpable. It was far removed from the breast tissue and the sections showed no evidence of breast glands in the vicinity although a careful search was made for them. We are inclined to believe therefore that it is a true epithelial cyst rather than a product of metaplasia of some preformed glandular structure. No history of trauma could be elicited in this case and the question as to the origin of the cyst is therefore an open one.

In conclusion I wish to call attention to the points that have been brought out in the study of my three cases. Two of the cases prove conclusively the correctness of the theory that traumatism is responsible for a certain type of epithelial cysts. One of the cases (No. 1) was noteworthy because of the peculiar appearance of the cyst being as it were implanted in the skin and subcutaneous tissues and lying partly within and partly without the integument of the finger. Apparently we have in Case 3 a cyst similar to those occurring in the hand but unusual in its situation.

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# SYPHILIS OF THE BONES AND SOME RADIO GRAPHIC FINDINGS \*

BY MARTIN W WARE M D

OF NEW YORK

Adj t G to-U ry S g t th Mt S i Hosp t f S geon t th Good sam rita  
D pe sary I tru t S g ry i th N w k P t-G d t Med cal School

THE earliest writings on De Morbo Gallico by Fallopi<sup>1</sup> in the sixteenth century bear witness to the recognition of syphilitic bone affections

Viewed in the light of an infection it lay in the nature of the syphilitic malady to look for metastatic deposits in bones as in other infections Clinically we have been wont to distinguish between the osseous lesions of hereditary and those of acquired syphilis Our understanding of the lesions peculiar to either of these will be made clear if we adopt the conception that the bone as a connective tissue harboring blood vessels and cells (in the marrow spaces) known as osteoblasts will react towards any organism as do other connective tissues Hence it is by way of the blood vessels that the infectious organism will be propagated The same holds good for the investing periosteum Its deeper layer is vascular and its blood vessels are continuous with those of the Haversian system and the marrow Therefore the whole pathological process is always to be regarded as an osteomyelitis either in the marrow or beneath the periosteum or about the epiphyseal line of ossification The extent of the process may be diffuse or circumscribed The specific pathological process may be gummatus sclerotic or purulent or a combination of these its end results may be the pathologic physiological conditions of necrosis osteoporosis sclerosis sequestra formation epiphyseal separation joint complication with functional disturbance interference with bone growth and spontaneous fracture Physically the bone is affected and we may speak of osteitis.

Read before the Harlem Medical Assoc at on February 6, 1907



In hereditary syphilis the lesion is located about the epiphyseal ends of the shaft (the ossifying zone of the cartilage) This lesion of osteochondritis, so fully described by Wegner,<sup>2</sup> Parrot,<sup>3</sup> and Taylor<sup>4</sup> in the seventies of the last century, has in no way up to the present time been enlarged upon, but verified innumerable times Its essential features are a proliferation and dystrophy of the cartilage cells with increased deposit of lime salts, and an irregular extension in the ossifying zones of the marrow spaces The blood-vessels, few in number, become still further encroached upon by the cells, in consequence of which degenerative changes take place (Waldeyer<sup>5</sup>), resulting in granulation tissue of a low order, causing necrosis, hence epiphyseal separation Beneath the periosteum there is proliferation and erosion of the underlying bone In still-born macerated infants of syphilitic parentage, when all the other salient features of the disease are absent, this bone lesion is demonstrable and almost stands out as a pathognomonic of the lethal disease Furthermore, of recent date is the observation of Betarelli,<sup>6</sup> who found the *Spirochæta pallida* in three still-born infants in the marrow, beneath the periosteum and in the ossifying zone of the cartilage

Clinically, even when there is no palpable enlargement of the epiphyseal ends of the bones, the existence of an involvement is revealed by the presence of a palsy of the upper extremity which is titled as the pseudoparalysis of Parrot It is encountered within the first months of infancy, generally affects the upper extremities, and when unilateral often simulates birth palsy This latter condition is not painful and may be excluded by the absence of reaction of degeneration The condition of subluxation of the radius (Streubel, Hutchinson), also spoken of as painful paralysis of young infants (Chais-saignac), following an inadvertent traction of the forearm, may simulate this pseudoparalysis, but the clicking sensation or noise coincident with the replacement of the subluxated radial head restores motion to the lifeless arm even if the pain does not disappear immediately

At times there is deformity about the epiphysis of the

lower end of the humerus due to subperiosteal deposits or that of the radius and more rarely with epiphyseal separation increased mobility of the epiphysis may be made out with or without crepitation. Acute inflammatory signs and suppuration if they exist are due to a complicating pyæmic infection emanating perhaps from the umbilicus perhaps from an infected circumcision or of gonorrhœal origin.

In the lower extremities in the presence of the osteochondritis in contradistinction to the palsy of the upper extremity the limbs are held in a contracted position.

Nor is this osteochondritis limited to the long bones. It occurs rarely in the metacarpal bones and the phalanges and is familiar to us from the writings of Bulkley<sup>7</sup> and Taylor as dactylitis syphilitica. One more or all the long bones of each hand may be affected. These spindle shaped swellings are very tender and owing to the process of rarefaction of bone in the interior the cortex may be easily indented (*spina ventosa*) giving rise to the crackling sensation of parchment or egg shells or the bone is very much thickened. Where one bone as an isolated lesion of hereditary syphilis is affected there is great difficulty of its differentiation from tuberculous dactylitis. Where many phalanges are affected there is a possibility of confounding the condition with rachitis. Quite common is the syphilitic onychia and in later hereditary syphilis the saddle nose and perforation of the hard palate.

Where doubt is entertained as to the nature of the lesion it has been shown by Kienbock and Hocksinger<sup>8</sup> of Vienna that the X rays give a definite picture. The epiphyseal ends of the diaphysis (not the epiphysis) are enlarged and translucent and the periosteum is very much thickened. In tuberculosis on the contrary there is never any periosteal reaction there is always a great deal of involvement of the soft parts and the cortical layer of the bone is never of that density peculiar to syphilis. The bone is not translucent but rather porous. In rachitis where the pathological changes are also most active at the epiphyseal line the X ray generally shows a cup shaped defect of the diaphyseal parts.

In the later forms of hereditary syphilis other parts of the skeleton may become affected, and there we have to deal with an osteomyelitis of the shaft in the form of a central gummata, sclerosis of the bones with deformities resulting in "sabre en lambe" and osteitis deformans. Often the long bones are the seat of spontaneous fractures.

In passing I wish to say that the healing of these fractured bones may not at all be retarded even without treatment, and the same holds good for the bones of syphilitic infants fractured *inter-partum*, whether dependent on diseased bone or not, as I have seen on two occasions.

In acquired syphilis, contrary to prevailing belief, bone involvement is present even at the time of early secondary manifestations, and nodes of smaller size on the head, ribs, and sternum are often encountered. These syphilitic deposits as expressed by Mauriac<sup>9</sup> are the analogue of the adenopathy, they are transient and have nothing in common with the later gummatous deposits.

In the tertiary period true gummatous deposits are encountered in the marrow and beneath the periosteum of the long bones and in the bones of the skull, and it is the opinion of Lewin and Eschle that the pathological changes are most marked about the blood-vessels. Gummatous deposits in the marrow may be very small and overlooked *intra vitam* as responsible for the osteitic pains in syphilitics. Thus Chiai<sup>10</sup> found in 27 syphilitic cadavers, 9 cases of gummata in the long bones. The larger gummatous deposits of the flat bones, sternum, clavicle, skull, and shafts of the long bones are more readily recognized, and yet there is the possibility of confounding them, where corroborative evidence of syphilis is wanting, with tuberculosis, blastomycetes, sarcoma, and actinomycosis.

Tuberculosis of the shaft is secondary to an extension from the epiphysis, the finding of the tubercle bacillus will dissipate all doubt. The use of tuberculin is unavailing, for Billroth has pointed out that in syphilis and actinomycosis a typical reaction can also be obtained. In the very rare instances where the blastomyces forms subperiosteal swellings

microscopic examination will show the presence of blastomycetes. Sarcomata and likewise the ray fungus may be found—nevertheless the last resort to the microscope may even be unavailing. However the X rays have become the final arbiters for all of these and the independent observations of Albers-Schonberg (Hamburg), Hahn<sup>11</sup>, Kohler (Wiesbaden)<sup>1</sup> and Ritter<sup>13</sup> have resulted in giving us an analysis of the Rontgenograms of syphilitic bone affections which coincides in most respects and harmonizes with the pathological findings. They regard as typical the dense shadows formed by the periosteum and the corticalis amounting at times to the obliteration of the medullary cavities. In other parts there are areas of translucency due to absorption of the bone. It is this participation of the periosteum which guards against its confusion with neoplasm for the latter causes absorption of the bone and causes very abrupt termination of bone limits and no shadow formations due to proliferation.

The following radiograms tend to confirm the findings of these aforementioned authorities.

Figs 1 and 2 represent the anteroposterior and lateral views of radiograms of a syphilitic arthritis of the elbow. The patient has for many years been under the care of Dr B. Lapowski. This bone affection has resulted notwithstanding persistent antiluetic treatment with injections of soluble and insoluble mercury salts. The lower end of the humerus increased in size, presents a thickening of the corticalis to the extent that the medulla is obliterated. There are three areas of absorption which are surrounded by thickened bone.

In Fig 3 from the same patient the middle third of the ulna shows an obliteration of the medulla which is replaced by thickened corticalis. A few areas of absorption surrounded by thickened bone can be made out also. In the middle third of the radius whereas the corticalis and medulla are normal there is clearly to be seen a subperiosteal deposit and a bowing of the shaft due to an increase of its length (Fournier).

Fig 4 from the same patient is a radiograph taken at the site of a very tender area of the lower third of the tibia corre-

sponding to which there is to be seen a thickening of the corticalis at this level

Fig 5 was a radiograph obtained from a female, æt 28, who, besides her dactylitis, had a subperiosteal gummata of the os frontis. Though married four years she has borne no children, but has aborted several times. The radiograph of the dactylitis shows an increase in the corticalis in the entire extent, amounting to an obliteration of the medulla in the centre. The epiphyseal end of the shaft—not the epiphysis—shows an area of absorption. The soft parts are not involved.

In tuberculosis there is translucency due to absorption and atrophy of the bones, at times small sequestra, but never any increase in the shadow due to bone proliferation, nor thickening of the periosteum.

Fig 6 is the radiogram of a girl 8 years of age, concerning whom no specific history was to be elicited. Contrary to the X-ray findings, she was subjected to an operation for the marked swelling of the soft parts. Examination of a section removed revealed the existence of gummatous deposit.

This radiogram shows the periosteum of the ulna thickened and lifted up by a gummatous deposit. The corticalis is increased in thickness and encroaches upon the marrow. The ulna is curved because of the greater increase in growth of the bone length in the continuity of the shaft than at either end (Fournier), and the medulla in the centre of the radius is encroached upon by the thickening of the corticalis.

These radiographic findings harmonize with the pathology, for in the subperiosteal gummata we can define a central area of softening surrounded in the periphery by a zone of thickening due to proliferation beneath the periosteum. These gummata may perforate spontaneously and discharge by a minute sinus, which latter again serves (Koenig) to distinguish it from the larger, fistulous openings of tuberculosis. Before the advent of any accessory infection the fluid discharged may be mucilaginous and cheesy, later it is purulent, and when healing is complete we have the cicatrices adherent to the underlying bone which are also peculiar to syphilis.

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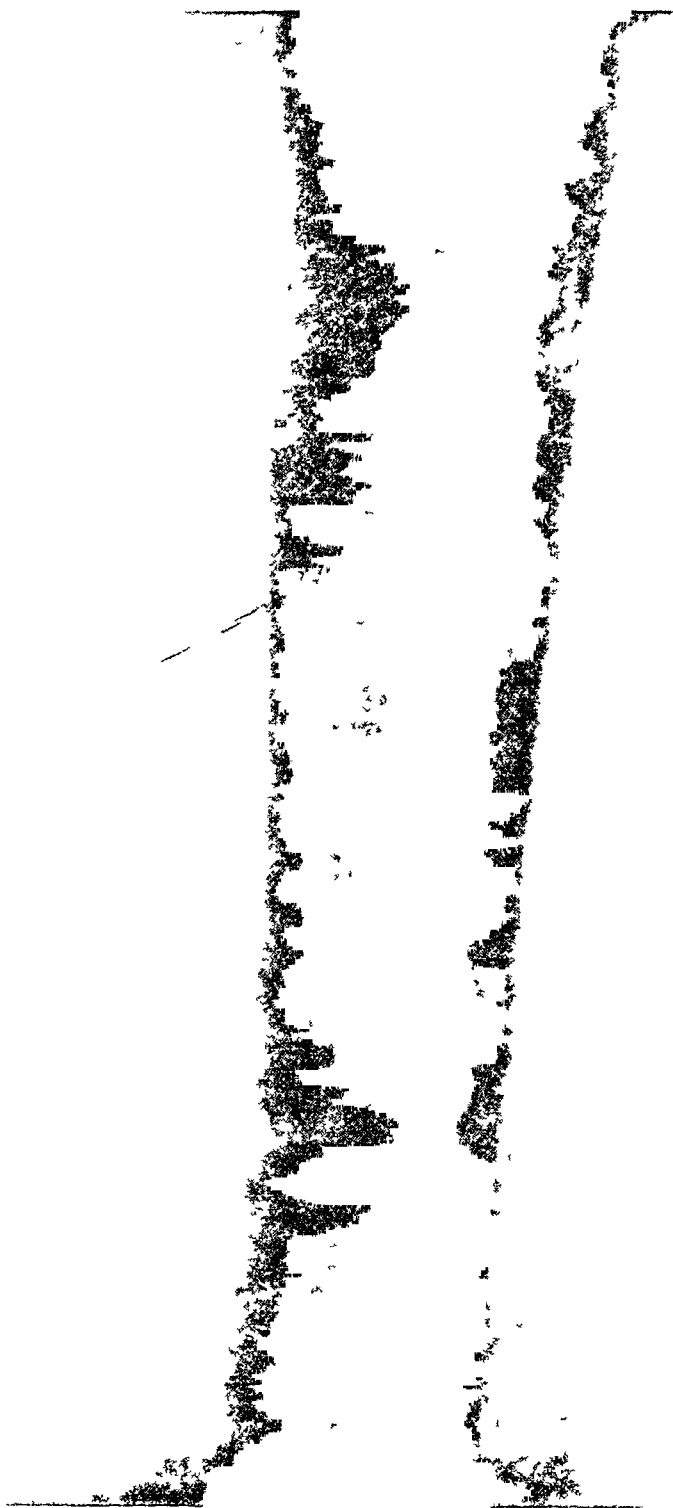


Lower end of humerus shows areas of absorption surrounded by areas of ossification





FIG 4



Thickening of the corticulis of the lower  $\frac{1}{2}$  of the tibia (A)



Syphilit Dactyl Th k f rt l Absop f h b l f l m t p



Ulna is bowed (Gourner) The cortic this thickened encroachments on medulla The periosteum thickened is lifted up from the underlying bone by a gummatous deposit The cortic this of radius is thickened at its center

Syphilis involving the joints is secondary to extension from the epiphyses and the greater participation of certain joints particularly the elbow joint in the process has been attributed to the fact that the juxta epiphyseal line of cartilage is intra articular whereas in other bones much of the epiphysis and diaphysis is extra articular There is however a pure synovial type of syphilis which can only be diagnosticated by exclusion and gummatous deposits may be situated in the capsule and the bursa about these joints

As far as the X ray examination is concerned we note an identity in the bone findings of congenital and acquired syphilis which is not encountered in other bone lesions

Caries sicca and craniotabes of rare occurrence have been omitted for the authorities differ as to their common cause Virchow claims caries sicca to be syphilitic Koenig assigns tuberculosis as the cause Parrot and Taylor regard craniotabes as syphilitic Future X ray examinations will no doubt offer a solution of this problem

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## THE CORRECTION OF CERTAIN FORMS OF "SADDLE-NOSE"

BY LEONARD FREEMAN, M D,

OF DENVER, COLO.,

Professor of Surgery in Gross Medical College

EACH race of people accepts a particular type of features as the normal, and marked variations from this are sure to attract undesirable attention, especially when they concern the nose. Among Caucasians one of the most objectionable deformities is the so-called "saddle-nose," which may be due to disease, to injury, or to lack of development.

Many methods have been devised for the correction of saddle-nose, some of them consisting in the sliding of bone-flaps from the forehead, others in the subcutaneous insertion of metal or celluloid plates, and still others in the injection of paraffin.

The use of bone-flaps should be reserved for bad cases, arising from injury or disease, in which there is great deformity and much cicatricial contraction, but the results are usually unsatisfactory owing to operative limitations and to the formation of unsightly scars. In comparatively mild cases, and in those where the skin is loose and can be stretched, it is better to insert plates or to inject paraffin.

So much attention has been directed to the use of paraffin, since its introduction by Gersuny in 1900, that the employment of metal supports has been relatively neglected, but, after trying both methods, I am convinced of the superiority of the latter in certain cases, providing they are properly inserted.

Cold paraffin may be injected in a semi-solid form, like firm vaseline, and this often answers the purpose admirably, when the skin is loose and the deformity not great. Another method is to employ more solid paraffin, with a high melting point, which is injected in the fluid state, while hot, and which

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\* Read before the Denver City and County Medical Society

undergoes subsequent solidification. In either procedure however it is difficult to control the distribution of the material in the subcutaneous tissues especially if tension exist. In spite of the utmost care the paraffin will find its way down the sides of the nose or up onto the forehead where its presence is not desired. There is also the risk of embolism which although small is always present, particularly when fluid paraffin is used a number of cases of blindness from this source having been reported. In addition sloughing of the skin has occurred from the employment of hot material under pressure. Fluid paraffin is also difficult to manage owing to its tendency to solidify in the injecting needle.

By the proper use of metal or celluloid plates these dangers and difficulties may be avoided. They are indicated in cases in which the deformity is so great that in order to correct it paraffin would have to be injected under considerable pressure and yet not so great as to prevent sufficient stretching of the skin to permit the insertion of a plate. Very bad cases in which the skin is bound down by scar tissue must be treated by plastic operations if it is thought best to do anything with them at all.

The plate may be made of celluloid silver or gold celluloid being perhaps preferable. Its length should be carefully determined so that its upper end will rest upon the bone above while its lower end is supported by the firm tissues of the extremity of the nose. The corners and edges should be well rounded and not too sharp and it should be perforated with as many small holes as possible without weakening it too much in order to permit of easy and thorough incorporation within the tissues. It must be curved slightly from side to side and wide enough to properly round out the bridge of the nose. It must not be unnecessarily thick but it must be heavy enough to keep its shape under all ordinary conditions.

Plates for the correction of saddle nose were formerly inserted in one of two ways either through a horizontal incision along the bridge of the nose or through an incision in the septum below the tip the skin being undermined with scissors

as far as necessary (Monks) There are objections, however, to both of these methods, although many good results have been obtained The incision along the bridge is the least desirable, and should be discarded, because it leaves a conspicuous scar and does not provide for stretching of the skin when necessary, which may cause gaping of the wound and sloughing out of the plate, as happened in a case coming under my observation

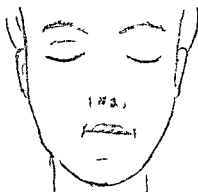
The incision at the tip of the nose, although better than that along the bridge, does not fulfill the conditions as it should It is rather difficult, for instance, to tunnel through the tough tissues at this point, there is considerable likelihood of perforating the nasal cavity, and the danger of infection from the nostrils is not to be wholly disregarded There is likewise difficulty in stretching the skin

Recently I have devised a method of operating which seems to overcome these objections A short incision is made across the root of the nose, between the eyes (Fig 1) Through this the skin is undermined along the bridge to the tip, and also well down the sides if the skin require much stretching This is easily accomplished, almost bloodlessly, by inserting a pair of blunt scissors, curved on the flat, and opening and closing the blades as they are pushed forwards

If the "saddle" is pronounced, the skin can be stretched by inserting under it the point of an ordinary blunt, curved sound, with the convexity resting upon the forehead in order to obtain leverage (Fig 2) After the pocket beneath the skin has been prepared it will be found that the concavity of the nose will necessitate the insertion of the plate at such an angle that its end will catch in the tissues, thus preventing it from sliding into position In order to obviate this, the tip of the nose should be perforated with the point of a large darning-needle The needle should then be reversed and its blunt end pushed upwards subcutaneously until it passes out through the incision (Fig 3) On top of this needle, as a guide, the plate may easily be slid into place (Fig 4)

The wound is then closed with a subcuticular suture, or a

F



Sh f oo f

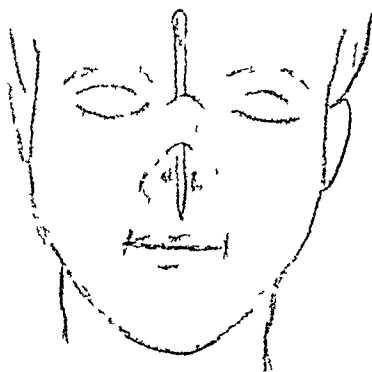
F



S et h g l l k er h l p



FIG 3



Needle inserted for guide

FIG 4

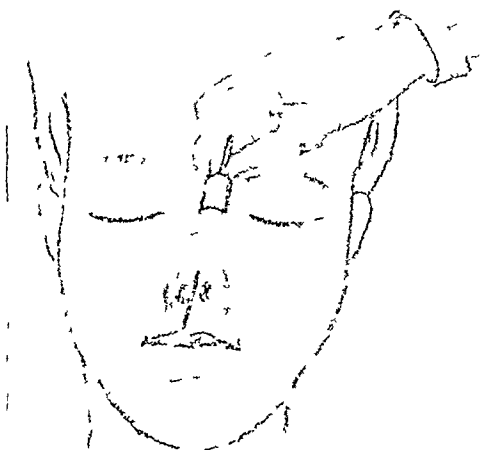


Plate being slid into place

little cotton and collodion. There is no tendency to gaping. The insignificant scar resembles a natural crease in the skin and is scarcely if at all noticeable.

I have operated once in this way and can testify to the comparative ease of the procedure and to its superiority over the method by horizontal incision which I have also used. The case was one of marked saddle nose resulting from specific disease in which the deformity was too great to be overcome by the injection of paraffin. The operation was done as outlined above, the skin being stretched by means of a sound. Primary union occurred and the result remained satisfactory for about eight months, but the corners and edges of the plate being rough and sharp it finally perforated the nasal cavity and had to be removed. This was the fault, however, of the plate and not the method and could readily be avoided in the future.

# INTUSSUSCEPTION

BY JOHN D RUSHMORE, M D,

OF BROOKLYN,

Surgeon to Long Island College Hospital and St Peter's Hospital

THIS paper deals with the consideration of cases of intussusception during the first twenty-four hours after the onset of the disease. In order to collect a sufficiently large number of cases from which to draw fairly definite conclusions, Dr Daniel Lewis, editor of the *Medical Review of Reviews*, has at my request had a search made through the files of that journal of cases reported during the last five years. The list of 203 cases furnished me by Dr F Robbins, to whom my thanks are due, with 96 cases by Clubbe in a brochure kindly loaned me by my friend Dr Charles T Poore, and two of my own cases not hitherto reported, make a total of 301 cases. Of these, 194 were males and 92 females. In the other cases the sex is not given. Males are therefore about twice as liable as females to this disease, and these figures confirm what has many times been stated with reference to the relative frequency of intussusception in the sexes.

Evidence furnished by the material at my disposal has a somewhat important bearing on the etiology and diagnosis of intussusception, but especially on its prognosis and treatment.

The conditions that favor the development of intussusception are evident enough, but the exciting cause still remains obscure. The age, the relatively long mesentery, the presence of the ileocæcal valve at the termination of the small intestine and the larger lumen of the cæcum and the colon beyond, the circular disposition of the muscular fibres, are all favorable anatomical conditions for an intussusception, and the physiological action of the intestinal tract with its sometimes irregular muscular contractions add to the risk of the development of the disease, for in the normal action of the intestinal muscles

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\* Read before the New York Surgical Society, April 10, 1907

the subject is all the time on the border of an intussusception. These conditions however never of themselves produce trouble. The immediate cause must be sought elsewhere. I think the study of statistics and experience in the treatment of intussusception will impress one with the important part that the contents of the intestines play in the immediate causation of the disease. Once started the condition is easily explained but the generally accepted etiology seems to lack a starting point. Treves says: "There is practically unanswerable evidence to show that intussusception is brought about by irregular action in the muscular wall of the intestine." This is undoubtedly true but it leaves us ignorant of the cause of the irregular action of the muscle. Nothnagel says:

If I understand this matter correctly true sequence of events is the following: While the bowel is performing normal peristaltic movements an annular and strictly local constriction of the bowel happens to occur. This constriction may be greater than normal and so pronounced that the limit of physiologic invagination is exceeded and the first degree of pathologic intussusception develops exactly in the same manner as it has been seen to do in our experiments. It is quite unnecessary to invoke any primary causative factor what is needed is a simple increase in the intensity of the normal movement of the bowel which of itself is sufficient to produce this dangerous condition. On this basis too the great predominance of invagination of the bowel in early childhood can be satisfactorily explained for it is usually admitted that at this age the bowel is more irritable and more mobile than in later life. The proof of this assumption is that the so-called agonic form of invagination is most frequently found in the bodies of children.

This explanation would seem to be inadequate to account for the very beginning of an invagination. The irregular muscular contraction does not happen to occur but must be due to some temporary cause differing from the constantly present conditions that favor the development but never by themselves cause invagination. It seems reasonable as noted above that the starting point may be found in the presence

of material inside of the gut, which by its bulk or by chemical irritation excites the spasm or irregular muscular contraction which is essential in any form of intussusception. The spasm by itself is not sufficient to cause the invagination. In the diarrhoeal diseases of children there is pain, irregular muscular contraction, spasm, increased peristalsis, increased irritability and irritation, but invagination occurs so seldom that it may very well be doubted whether the invagination has been due to these causes alone. If there is added to these conditions a mechanical obstruction furnished by the contents of the intestine, the invagination is not difficult to explain. And, recognizing the existence of reversed peristalsis, which may be present in any form of acute obstruction of the intestine, it is not more difficult to account for the rare cases of retrograde invagination than for the direct form. If we examine the varieties of intussusception the evidence in support of the idea that mechanical obstruction is the primary cause of invagination is strengthened, for in by far the largest number of cases the lesion is found at or near the ileocaecal valve, a few occur in the large intestine, still fewer in the small intestine and 8 out of 14 cases reported in the small intestine had a diverticulum at the lower end of the intussusception. These diverticula located in the lower part of the ileum, where the bowel contents are acquiring a less fluid character, furnish a ready starting point for an invagination. The list below gives the location of invagination in my cases where it is definitely stated

|                      |     |                                |    |
|----------------------|-----|--------------------------------|----|
| Ileocaecal           | 140 | Cæcum-ascending and transverse |    |
| Ileocolic            | 31  | colic                          | 1  |
| Enteric-ileocaecal   | 13  | Meckel's diverticulum          | 1  |
| Ileocolic-ileocaecal | 4   | Diverticulo-enteric            | 1  |
| Diverticulo-ileac    | 4   | Retrograde-enteric             | 1  |
| Colic                | 6   | Diverticulo-ileo-ileocolic     | 1  |
| Cæcal                | 2   | Ileocolic and iliac            | 1  |
| Cocolic              | 3   | Double                         | 19 |
| Ileo-appendix        | 1   | Double iliac                   | 1  |
| Transverse colic     | 1   | Iliac                          | 2  |
| Diverticulum         | 1   | Enteric                        | 3  |

In all 237 cases. Fourteen in the small intestine, 17 in large intestine, and the rest, 206, combined. A consideration of the

above figures and the conditions that are anatomically and physiologically present in intussusception makes it at least reasonable to think that a mechanical cause as above suggested was the starting point in invagination. The so-called agonic forms of this disease which are found in the lower intestine small in size not infrequently multiple and sometimes retrograde producing no symptoms are more probably due to centric causes and seem entirely different from the cases considered in this paper.

In this connection I desire to present two patients who have recovered from intussusception together with a brief history of each case.

CASE I—Male nine years of age sent into hospital by Dr C J Noonan May 23 1906 with the history of having been seized with sudden violent pain on the street twenty two hours before he entered the hospital. There had been some nausea but no vomiting frequent desire to stool but no passage of blood or mucus temperature normal from the beginning pulse normal first twelve hours about 110 in hospital no shock at any time slight distention a tumor first recognized after twelve hours between gall bladder and umbilicus about six inches in length tender on slightest pressure. The boy had had three injections without effect except a slight streak of blood after one of them.

Immediate laparotomy under ether and delivery of tumor. It was interesting to observe after partial reduction and letting up on traction the intussusciens sliding up over the intussusceptum instead of the intussusceptum gliding downwards into the intussusciens. The upper end of the sheath was slit like from traction by mesentery and not round. There was no spasm, indeed by very slight pressure the finger could be easily inserted for a distance of two inches between the sheath and the intussusceptum. Traction had little effect in reduction. The mass with the exception of the last inch or two was easily reduced by combining traction with pressure and by utilizing the intestinal gas below the mass and employing the process that the farmer uses in milking but in reverse direction flexing the little finger strongly and then the ring middle and first finger successively in this way sufficient pressure was made on the gas locked up between the

fingers and the intussusceptum to distend the sheath and also press out some gas and blood from the intussusceptum and to render the reduction easy. The lower end shot out by a little added pressure and revealed a much swollen diverticulum. Fourteen inches of gut were gangrenous—the lower end of demarcation very distinct, the upper line rather ill-defined. The mesentery was twisted on itself and was untwisted in the reduction. The whole mass was excised, end-to-end anastomosis with continuous glover's suture through all the coats, using No 2 plain catgut, secondary continuous Lembert suture in peritoneal coat with No 1 plain catgut, suture of mesentery, layer sutures for abdominal wall, rectal feeding three days, normal bowel action third day without drugs, moderate febrile reaction for four days. Satisfactory recovery and the boy remains well after seven months.

CASE II—Female, seven months old, seized with pain suddenly at twelve midnight, vomiting immediate, blood and mucous stool within an hour. Seen by Dr F C Paffard about three P M, temperature  $99\frac{1}{2}$ , pulse 140, tumor in left iliac fossa, no shock, no tympanites, only on deep pressure over tremor was there tenderness, child looked well, laparotomy under ether seventeen hours after onset of symptoms, ileocæcal variety, felt in rectum, reduction easy except last three inches, slight dimple left in caput coli, layer sutures, vomited for twenty-four hours, but nursed also, bowels moved by enæma third day, temperature was about 100, subsequent recovery smooth.

Both of these cases furnish the ordinary symptomatology of intussusception, and illustrate both what we may and may not be expected to find as a basis for our diagnosis.

Osler says, "Intussusception is an affection of childhood and is of all forms of internal obstruction the one most readily diagnosed. The presence of tumor, bloody stools and tenesmus are the important factors. The tumor is usually sausage-shaped and felt in the region of the transverse colon. It existed in 66 of 93 cases. It was present on the first day in more than one-third of the cases, on the second day in more than one-fourth, and on the third day in more than one-fifth. Blood in the stools occurs in at least three-fifths of the cases, either

spontaneously or following the use of an enema. The blood may be mixed with mucus. Tenesmus is present in one-third of the cases. Fæcal vomiting is not very common and was present in only 12 of the 93 instances. Abdominal tympany is a symptom of slight importance occurring in only one-third of the cases.

An examination of the details of cases so far as they are given by the different reporters will justify the following statements. The disease occurs among previously healthy children in a large majority of cases and any previous illness in the small minority has little or nothing to do with the causation of the invagination. The attack is sudden characterized by severe paroxysms of pain and pallor. It is noticeable how seldom shock is mentioned as a symptom in the reported cases. The statement is emphasized that most of the patients after the pain ceases look well. Clubbe says

the child may not look ill its pulse rate may be hardly varied and its temperature may be normal. It is to be noted that he is speaking of cases seen in the first few hours. So-called shock symptoms develop later and are symptoms rather of collapse or sepsis than shock. Tympany is not a prominent symptom except late when inflammatory symptoms occur. I should think the tumor if the examination is properly made would be found in more than 66 of 93 cases. Clubbe states that in his cases (124) as a mass is invariably present in cases of intussusception it should be possible to make it out if we examine carefully. I can only remember two cases in which I opened the abdomen without first feeling the mass. In these cases there was much distention but the history and the symptoms were characteristic. In doubtful cases a general anæsthetic ought always to be used and bimanual palpation employed remembering how the mass may slip away and reappear or be hidden about the hepatic or sigmoid flexure of the colon and that it may not always be sausage shaped. We must not expect rectal examination to throw much light on these early examinations nor in the less frequent cases where the small intestine is the seat of the disease. The bloody stools



with mucus and tenesmus are present in 97 per cent of Clubbe's cases within from two to ten hours. The tumor can be recognized as early as three hours after onset of symptoms. Judging from the agonic forms of invagination that occur just before death it is certain we should not be able to feel the tumor in a living subject immediately after the first paroxysm of pain, but in one case it was felt at the end of two hours. Intestinal or faecal vomiting has been noted in comparatively few cases and in those as a later symptom. In almost all cases we shall rely for diagnosis on the sudden attack of severe abdominal pain, blood and mucous stools, tenesmus and tumor. Where rectal symptoms are absent and the others present, I should feel that the disease was in the small intestine as the discharges come directly from the mucous membrane of the colon, and in the enteric form must be present as a later symptom.

The prognosis of intussusception and the effect of prompt and late resort to operative measures is well shown in the following table by Weiss

#### 321 CASES FROM 134 PUBLICATIONS

|                        | New born<br>infants | Children up<br>to puberty | Adults |
|------------------------|---------------------|---------------------------|--------|
| Conservative treatment | 16%                 | 22%                       | 26%    |
| Immediate laparotomy   | 61%                 | 90%                       | 85%    |
| Late laparotomy        | 54%                 | 50%                       | 50%    |

In regard to the treatment of intussusception, all the reports with no exception emphasize the necessity of early treatment. One reports success in a large percentage of cases by taxis, some are in favor of injections, inflation or manipulation, separately or combined, as a first resort, and laparotomy in those cases in which these measures fail. The rest are in favor of immediate laparotomy. The favorable results from taxis are shown by the following report of the experience of Hirschsprung. "The author reports 107 personal observations on intussusception in children, varying in age from seven weeks to seven years (77 boys and 30 girls). Of these 107 patients, 65, 60, 75 per cent recovered. Laparotomy was

rarely required since taxis under general anæsthesia usually led to a cure. It was rendered very evident that the prospects of recovery improve with the prompt institution of the treatment after the onset of symptoms. The duration of the disease before hospital treatment could be ascertained in 84 of these cases and may be divided into three groups

1 Admission twelve hours after onset of disease 15 children Died 1 child Percentage of deaths 6.07

2 Admission between twelve and twenty four hours after onset 28 children Died 10 children Percentage of deaths 35.7

3 Cases over twenty four hours old 41 children Died 22 children Percentage of deaths 53.66

Of the forty four children under one year of age (25 boys 19 girls) 70 per cent. recovered if the disease had lasted less than twenty four hours if longer only 30 per cent. recovered. The duration of the disease increases in importance with the youth of the child.

In regard to the use of taxis injection inflation or inversion there may be two very important objections urged.

*First* That the condition of the intestine can never be known. It is true the probability of gangrene in cases treated early is less than when treated late but this is by no means always true for in the cases tabulated below the gut was found gangrenous in eight fatal cases when the operations had been performed within twelve hours from the onset of symptoms one as early as three and one half hours two in six hours one in ten hours one in eleven hours and three in twelve hours and one in a few hours and besides as in my own reported case there may be no systemic symptoms to indicate the presence of gangrene.

*Second* There is a doubt after using any of these measures as to its success. We can never be sure except by waiting and so possibly losing valuable time whether the invagination has been entirely reduced for vomiting may continue after reduction and the bowels fail to act for a day or two fever be present and some tenderness. On the other hand it is

recognized that there is some danger in exposure of the intestine to the atmosphere and even more in the direct handling of it, in reduction, but it may be that these dangers have been over stated, and that they may be attributed, in some cases at least, to our over zealous efforts by drugs and enemata high and low and too long abstinence from food before operation, to too prolonged efforts to disinfect the intestine which may after all be only germ infested and not germ infected. The advantages, however, of direct manipulation of the gut through an abdominal wound, and being able to see what is being done, so far outweigh the dangers that it would probably be better in all cases to omit the employment of all other means and do an immediate operation. In doubtful cases a general anæsthetic will aid in a diagnosis, and we should give the patient the benefit of the doubt by operating at once rather than wait for future symptoms to develop.

In those cases where means other than operation were employed, water injection has failed in about 12 cases, in one of which the seat of the invagination was in the small intestine, water injection was successful in 5 cases, in one of which laparotomy demonstrated the success of the enæma.

In one case water had been used with apparent success, but was found to have failed by the laparotomy. Massage and inflation used in one case failed. Inflation failed in one case. In one case the invagination was shown by the laparotomy to have reduced itself.

The influence of age and the time of operation after onset of symptoms is well shown in the following table.

Figures, as far as they can be depended on, would therefore prove that age exerts a very material influence in the prognosis of intussusception, that the mortality on account of age alone is practically twice as great during the first six months of life as after eighteen months. When the element of time is made the basis of prognosis the greatest encouragement is offered.

Wiggin, quoted by Warren, says, "Counting only the operations that have been performed since the perfected technic



cent This, Wiggan believes, to be a fair estimate of the risk to-day of laparotomy performed on a young infant for the relief of this disorder, if done within the first forty-eight hours of the onset This gives a chance of success represented by 78 per cent, which, according to this author, would speedily rise to 90 per cent, as the cases come more frequently to operation during the first twenty-four hours

To what extent this prediction has been fulfilled is shown in the following table made up of the number of cases, recoveries and deaths, by time of operation after onset of symptoms

It will be noticed from the figures given what a comparatively low mortality will follow operation during the first twelve hours

The causes of death, when mentioned, were shock 7, peritonitis 7, collapse 4, cyanotic pneumonia 1, second invagination at post mortem 1, tubercular mesentric glands 1, gangrene 3, marasmus 1, fæcal fistula and pneumonia 1, asthenia 1, hyperpyrexia 1 Twenty cases were subjected to reduction with apparently only two recoveries Lateral anastomosis was done in one fatal case, death followed in one case of failure of reduction, no definite relation appears to exist between the special variety of intussusception and recovery or death

The history of cases where gangrene has occurred has up to the present time furnished little encouragement to surgeons, and the experience of writers above recorded corresponds to the general experience of surgeons The cases almost always have a fatal termination Only 2 out of 20 cases reported recovered It is to be noticed that in those 2 cases that the sutures used were a primary continuous through and through suture and a Lembert's continuous suture in peritoneal coat

The mortality in these cases corresponds closely to the mortality given in Eliot's paper on Acute Intussusception in Young Children My own successful cases reported above would lead me to think that a primary glover's suture and a secondary Lembert's peritoneal suture is preferable to any other, and that the section of the gut must be made well beyond

the gangrenous mass in healthy tissue and that the mesentery should be interfered with as little as possible not cutting into it deeply toward its root thus leaving the sutured intestine as well nourished as possible

It is interesting to notice how much advancement has been made in the treatment of intussusception in common with

| Time            | 1  | 2  | 3  |
|-----------------|----|----|----|
|                 | h  | h  | h  |
| 0 and on h lf h |    | 1  | 0  |
| Tw              | 1  | 1  | 0  |
| Three d h lf    | 1  | 0  | 1  |
| Four            | 3  | 3  |    |
| Five            |    | 2  | 0  |
| Six             | 3  | 1  | 3  |
| Seven           | 11 | 11 | 0  |
| Eight           |    | 11 | 1  |
| Nine            | 6  | 6  | 0  |
| Ten             | 1  | 1  | 1  |
| Eleven          | 3  | 2  | 1  |
| Twelve          | 5  | 19 | 6  |
| Thirteen        |    | 1  | 0  |
| Fourteen        | 2  |    | 0  |
| Fifteen         | 2  | 0  |    |
| Sixteen         | 6  | 3  | 3  |
| Seventeen       | 4  |    | 2  |
| Eighteen        | 15 | 10 | 5  |
| Nineteen        |    | 0  |    |
| Twenty          | 11 | 9  | 2  |
| Twenty one      |    | 1  | 1  |
| Twenty two      | 6  | 4  | 2  |
| Twenty three    | 3  | 3  | 0  |
| Twenty four     | 54 | 9  | 25 |
| Twenty five     | 3  |    |    |
| Twenty six      | 3  | 2  | 1  |
| Twenty seven    |    | 0  | 1  |
| Twenty eight    | 1  | 0  | 1  |
| Twenty nine     | 4  | 0  | 4  |
| Thirty          | 4  | 4  | 0  |
| Thirty one      |    | 2  | 0  |
| Thirty two      |    |    | 0  |
| Thirty three    | 25 | 4  | 1  |
| Thirty four     | 28 | 8  | 1  |
| Thirty five     | 41 | 19 | 2  |
| Total           | 31 | 22 | 99 |

|                                                     | Revealed | Diagnosed | Deaths |
|-----------------------------------------------------|----------|-----------|--------|
| Cases reported in first twelve hours                | 1        | 98        | 4      |
| Cases reported between twelve and twenty-four hours | 36       | 82        | 54     |
| Cases reported after twenty-four hours              | 53       | 22        | 31     |
| Total                                               | 31       | 202       | 99     |

most other abdominal diseases Bouchut says in 1855, "the diagnosis of intussusception is uncertain and treatment powerless" Tanner, sixteen years later (1871), after speaking of the treatment of taxis says, "supposing these means fail, without absolutely recommending such a procedure, an exploratory incision into the abdomen would appear to be perfectly justifiable in an apparently hopeless case" Even as late as 1881, Ashhurst's statistics gave little encouragement to operate, for he says, "past experience gives no encouragement to operative interference in cases of intussusception in infants less than one year old"

The advance made in the treatment of acute intussusception has been made mostly within the past fifteen years In 1892, "Keith Monsarrat, by grouping together cases from tables provided by Gibson, Wiggan, Barker, Pitts, Eves, and D'Arcy Power, obtained a total of 374 cases that had been operated upon, 181 were cured and 193 died, showing a mortality of 51.7 per cent" (Clubbe) Since that time the mortality has been practically reduced to the present very encouraging figures

From the foregoing facts one may gather some bedside suggestions that bear directly on the treatment of acute intussusception Intussusception is another name for internal strangulated hernia The symptoms, except the tumor, are in almost all cases evident and striking even to the layman, and the diagnosis is therefore comparatively easy to the medical observer Where the tumor is not easily felt, we fail in our whole duty to the patient if we do not employ a general anæsthetic for diagnosis instead of waiting to recognize the tumor later without it Treatment ought to be surgical and practised not only within the first twenty-four hours but within the first twelve hours, like the treatment of any other form of strangulated hernia, remembering that in those cases where gangrene occurs the process may be more rapid than other forms of hernia Laparotomy and manual reduction offer the patient the best chance of recovery Mechanical agents in reduction short of direct manipulation—such as air, gas, water,

oil etc while they are free from the danger of atmospheric exposure and handling of the gut are objectionable for the reason that we do not know without laparotomy the condition of the intestine to be reduced nor whether except by waiting it has been reduced. While young infants operated on for the relief of invagination show a relatively high mortality with very early operative interference we may expect a low mortality—at present 12.5 per cent.

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## OPERATION IN TWO STAGES FOR RELIEF OF ILEUS OF JEJUNUM.

BY ERNEST F ROBINSON, M D,

OF KANSAS CITY, MO,

Associate Professor of Surgery in the University of Kansas

THIS case is reported, first, because it illustrates the difficulty of determining, even at operation, the exact cause of obstruction, and second, because it demonstrates the wisdom of immediate drainage of the bowel with secondary resection in critical cases of acute ileus in which the integrity of the intestine is questionable

*History*—November 11, 1906, R E, 28 years old, mechanic, was suddenly seized with severe pain in the bowels after eating heartily. A cathartic relieved him, but the following night, pain returned and was very severe. It subsided toward morning, however, but a "dull, constant pain" remained, general at first throughout the whole abdomen, but later localized to a point just to the left and above the umbilicus. The bowels could not be again moved by cathartics or enemas. Great rigidity existed, but no tympany. No tumor mass could be felt. The abdomen in fact was rather scaphoid.

This condition existed for 24 hours, when he began to vomit contents of stomach and bowel, and later the vomitus contained bright red blood and many clots. This soon changed to "coffee ground" vomit with much mucus and occasional clots. Hic-cough developed. Temperature 97°, pulse 112, and slightly irregular. The rigidity and local tenderness increased, the point of greatest tenderness being three inches above and just to the left of the umbilicus. Enemas contained mucus and blood clots, but almost no fecal matter. By the time he reached the hospital, his temperature was 96° and pulse 128. The vomiting and hic-cough was continuous, and by the following morning, his temperature was 102°, pulse 140, face anxious, and abdomen slightly tympanic.

*First Operation (Fæcal Fistula)*—Ether, Dr Child and Dr

Chambers assisting The abdomen was opened in median line The intestines were much congested and somewhat distended with gas They were systematically examined the gut being replaced as rapidly as it was gone over The large bowel was normal In pulling up the jejunum near the duodenum the intestine was brought into the wound with difficulty and a retractor was moved thinking that it might have caught or compressed the bowel An inspection showed this was not the case but as the gut was brought into the wound an area about 10 to 12 inches long was encountered about 3 feet from the duodenum that was almost black greatly congested and covered in places with flakes of lymph There were a number of petechial hæmorrhages throughout this area The streaks of lymph were arranged in parallels at right angles to the bowel (as if an intussusception had been unfolded) and the mesenteric vessels were in places thrombosed The color of the gut partially improved upon exposure but so bad did it remain that it was brought down into the left iliac fossa and anchored there to form a fæcal fistula as soon as adhesions should form to protect the peritoneal cavity

The patient reacted fairly well from the operation Twenty four hours later however he became very restless His temperature rose to 102 pulse 136 abdomen tympanitic and all the signs of an extending peritonitis The bowel was consequently immediately opened Great quantities of blood and grumous material were discharged with the liquid fæcal matter His symptoms almost at once subsided and his improvement was rapid However by the seventh day it was noticed that the patient was rapidly losing in weight The abdomen was greatly irritated by the acrid discharges from the wound and his discomfort was great So high up had the bowel been opened that food taken by the mouth was often found only partially digested in the wound a short time after eating

*Second Operation (Closure of Fistula with Resection of Bowel)*—Ether was again given the fistula temporarily closed by a running stitch and the abdomen cleansed as thoroughly as its excoriated condition would warrant Dense adhesions were encountered on opening the abdomen In fact the whole mass of intestines were matted together so firmly that great difficulty was encountered in freeing the bowel at all and in doing so the

jejunum was so torn, that 5 inches of the gut were resected, the ends being brought together end to end with Lembert-Czerny sutures. A small gauze drain was inserted in the wound and the abdomen partially closed.

Recovery was uneventful, except for a slight leakage at the line of suture. This opening soon closed, and the patient went on to an uninterrupted recovery.

Owing to the extremely critical condition of this patient, the exact cause of the obstruction could not be absolutely demonstrated at operation. The weight of evidence, however, tends to support the opinion, that an intussusception existed, that was unfolded in the process of bringing the small gut into the wound and immediately replacing it. The parallel layers of lymph, the petechial hæmorrhages, and the thrombosed mesenteric vessels also support this contention. The congested area of gut, it is true, lay deep in the abdominal cavity, suggesting a retroperitoneal hernia, but this condition also exists frequently in intussusception, owing to the infolding of the lumen of the bowel on itself, and the consequent shortening of the mesentery. The history of the case, and demonstration of so much blood in the vomitus and in the washings from the bowel, also seem more consistent with intussusception than hernia or strangulation. Volvulus did not exist. There were no peritoneal bands nor rents in the omentum or mesentery. A hernia into the foramen of Winslow is extremely rare, and is said to exist only in those cases with an abnormal mesentery or an unusually large foramen, neither of these conditions existed in this case.

There was no co-existing heart-disease, nor evidence of acute embolism. Some of the mesenteric vessels immediately along the bowel were thrombosed, but this process seemed to be the result of some mechanical obstruction from without, rather than to disease or an occluding process within the lumen of the vessels. It is interesting to note, however, that the symptoms of mesenteric embolism, as given by McArthur in his careful study of this condition (*ANNALS OF SURGERY*, vol 33, no 4), almost exactly corresponded to those manifest in this case.

- 1 Blood in washings from the bowels in the bowel movements or in vomitus unaccompanied by tumor of intussusception
- 2 Colicky pains associated with pain in back and lumbar region
- 3 Early collapse if the embolism has been sudden or extensive
- 4 Cardiac disturbance rhythmia and great frequency of the pulse albuminuria

A diagnosis from intussusception or retroperitoneal hernia on these symptoms alone would however be impossible in many cases in which the presence of a tumor mass was absent. In my own case a small hernia into a retroperitoneal fossa could not be absolutely excluded. Moynihan gives the five most common varieties as 1 Superior duodenal 2 Inferior duodenal (Treitz) 3 Para duodenal 4 Mesenterica parietal (Waldeyer) 5 Meso colic fossa.

A brief description of these fossæ is essential owing to the confusion of terms.

1 *Superior Duodenal Fossa*—Present 40 to 50 per cent of the cases alone or with infra duodenal lies to left of ascending portion of duodenum looks downward. Apex extends up toward body of pancreas. Inferior mesenteric vein lies generally in superior duodenal fold (Jonnesco).

2 *Inferior Duodenal Fossa*—Most frequent 70 to 75 per cent more or less well defined left side of ascending portion of duodenum looks upward. Fundus inclines downward and to the right to root of mesentery. Superior and inferior at times blend and make oval opening.

3 *Para Duodenal Fossa*—Lies to left and some distance from ascending portion of duodenum caused by raising a fold from inferior mesenteric vein a mesentery to the vein looks downward with wide orifice.

4 *Mesenterica Parietal Fossa*—Generally formed by the meso-jejunum immediately behind the superior mesenteric artery and just below the duodenum.

5 *Meso Colic Fossa*—Formed by a fold containing the ascending branch of the left colic artery extends to the left between layers of transverse mesocolon—uncommon.

A small hernia into any one of these fossæ could very well

have existed in this case, and been unconsciously relieved by the process of "going over the intestines" The extremely critical condition of the patient precluded a protracted search for a cause that had been already relieved

The question of the proper management of these critical cases of intestinal obstruction is one of the most difficult in surgery The temptation to immediate resection is always great, but the results are frequently disappointing This applies particularly to resection for acute obstruction, associated with gangrene or thrombosis In the best hands, the mortality for immediate enterectomy is 50 per cent, and in some clinics runs as high even as 85 per cent Septic peritonitis is the cause of death This is the result of the lowered resistance of the peritoneum, and also is due to the fact that gangrene once started often extends beyond the line of sutures Sutures also placed in congested swollen tissue (as not infrequently they are) become loose and leak when the inflammation or induration rapidly subsides

The emptying of the bowel by a fæcal fistula does more than simply relieve the obstruction, it immediately relieves the acute congestion, and unquestionably checks a fulminating or spreading peritonitis Probably the best method to follow in these cases of early gangrene is that of von Mickleitz, by which he anchors the questionable loops of gut parallel in wound, the gangrenous portion being outside the abdominal cavity Thus, after the diseased area is removed, the continuity of the gut may be re-established by the simple application of a clamp, each blade of which enters the afferent and efferent bowel Pressure necrosis causes union after the manner of the Murphy button In my own case, an effort was made to close the fæcal fistula in this manner, but the forceps, when applied, caused so much pain and shock that they had to be immediately removed

The use of Paul's tubes would probably have prevented in some measure the great excoriation of the skin, had they been available Hockenegg's method of inserting a glass tube into the afferent end of the bowel, and the closure of the fistula after

12 days I can hardly see would have been any improvement on a simple fistula and the procedure followed in my own case

Acute gangrenous ileus from whatever cause is always one of the gravest conditions that the abdominal surgeon has to encounter. Treated by whatever method the mortality will always be high. Immediate resection is the ideal procedure theoretically but its failure in so large a percentage of cases practically precludes its application in all but the most favorable conditions.

The establishment of a faecal fistula can be done with the minimum of risk and after the acute symptoms have subsided the closure of the fistula can be accomplished with very little if any additional danger.

In cases of gangrene from thrombosis the only recorded cases of recovery have thus been (with one exception) treated by resection in two sittings. (Elliott ANNALS OF SURGERY vol xlii no 5)

My own case herein reported it is true is incomplete in the fact that the exact case of ileus and thrombosis was not incontrovertibly demonstrated. Its rapidly developing gangrene however places it among the critical cases of intestinal obstruction that are best treated by operation in two stages and it is offered as additional evidence of the wisdom of this method of procedure.

# AN ENORMOUS CYST OF THE URACHUS

EXTIRPATION AND RECOVERY

BY T L MACDONALD, M D,

OF WASHINGTON, D C

THE following case is reported on account of some unusual features, and because it should be added to the list reviewed by Dr W R Weiser, in a most interesting and instructive article published in the ANNALS OF SURGERY for October, 1906

Miss —, æt forty History of slowly growing abdominal tumor, beginning in the region of the bladder and growing upward, with gradual onset of pressure symptoms, especially difficult respiration, pain and impaired digestion The abdomen was enormously distended, but not tender, nor did it bulge much in the flanks It was rather firm, and was flat on percussion from the pubis to the ensiform cartilage Its appearance is well shown in Figure 1

*Operation*, October 6, 1907—Through the usual incision the cyst wall was perforated, and the fluid drawn off Two-thirds came away clear, the remainder was turbid, and, lastly, thick cheesy masses were wiped out Investigation of the inside of the sac disclosed several thick nodular masses, which were strikingly carcinomatous in character So far, the peritoneal cavity had not been opened, the sac being situated in front of it The task of separating the cyst wall from the peritoneum and viscera was begun by first stripping and cutting it from the epigastric region, and from beneath the ribs, and here the peritoneal cavity was opened It was hoped that from this point downward, the dissection would be less difficult, but it was more so The anterior surface of the peritoneum seemed to be fused with the sac, and the posterior with the viscera generally, and the character of the adhesions was the most dense ever encountered by the writer These were followed deeply into the pelvis, in all directions, and freed, and finally the firm, fibrous attachment to the bladder was severed, and the sac removed The appendix,

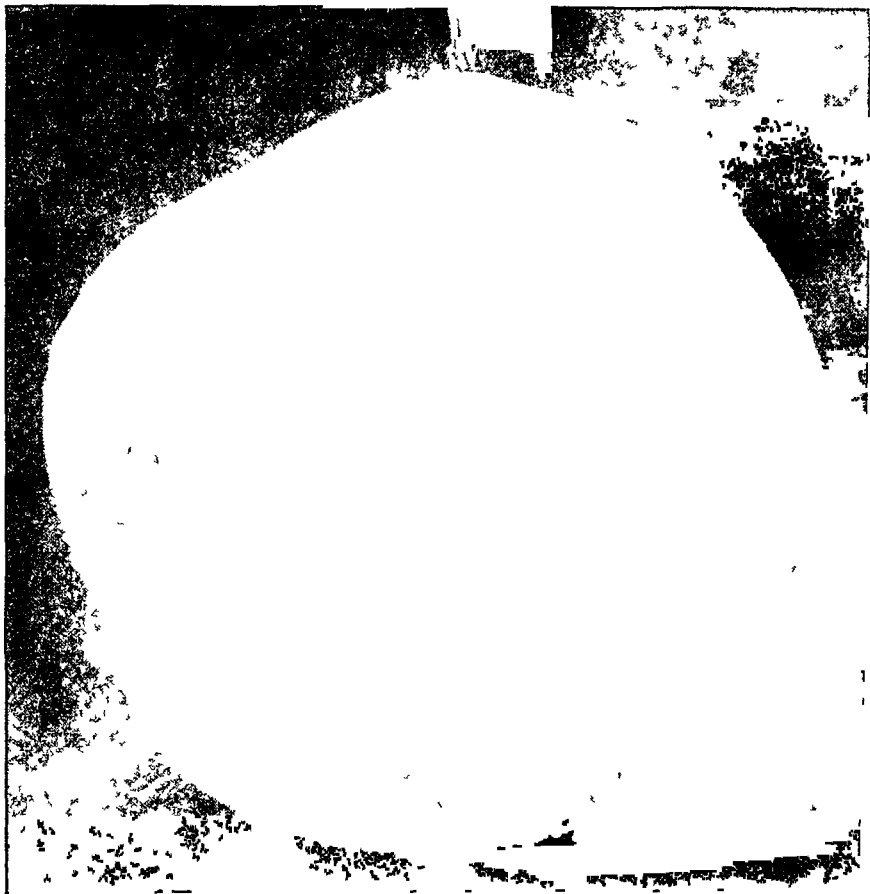
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FIG 2



The sac turned inside out showing the nodular masses  $\frac{1}{8}$  size

six inches in length bright red and surrounded by adhesions was also removed. The abdomen now presented a most unusual sight. With the exception of the anterior surface of the stomach not a vestige of normal peritoneum was visible. All the abdominal contents including tubes ovaries uterus and bladder could be seen outlined through the thin raw film of peritoneum to which they were firmly attached. The abdominal cavity was filled with normal salt solution and closed with three layers of buried absorbable sutures without drainage.

Figure 2 shows some of the nodular masses. There are others on the opposite side. These were on the inner surface of the sac which was photographed in this way. The cyst was turned inside out and through the incision which had served for the evacuation of the contents a large thin collapsed rubber punching bag was thrust then inflated thus distending the sac for photographic purposes.

The report of our hospital pathologist Dr Bird all shows the cyst wall to be fibrous and the nodular masses which during operation we feared were carcinomatous were papillomata. Of course in a cyst of this size which had been growing presumably for forty years and subjected to the ever increasing pressure of the accumulating fluid we could not expect to find the normal histological features of the urachus. Naturally all except the fibrous structures would disappear by pressure absorption even bone has been known to do the same.

*Post operative Course*—The patient's condition was critical for the two following days active stimulation and intravenous saline infusion being demanded. The wound healed by primary union the bowels were loose the temperature ranged from 101 to 102. Daily palpation of the abdomen revealed fluctuation and the percussion note was flat showing that the salt solution was not being absorbed. This was observed with much interest. On the seventh day a chill occurred followed by a rise in temperature to 104. Assuming that the unabsorbed solution had become infected through the raw surface of the intestines the lower end of the now healed wound was cocainized and cut through allowing the escape of quarts of the salt solution which had become purulent and which presented the colon bacillus characteristics. This was followed by prompt improvement. Drainage and irrigation were continued for a week after which

the wound closed, and convalescence and return to health were satisfactory

COMMENTS —The density of the adhesions cannot be appreciated unless encountered. It is true incision, evacuation and drainage would probably have been successful after a long period of waiting for the cavity to undergo obliteration. The assumption, however, that portions of the sac had become carcinomatous, made extirpation seem imperative.

Extirpation is evidently not commonly resorted to. Among the 86 cases reviewed by Dr Weiser, only 8 were extirpated. None of these were said to be large, and with one or more the history and result were lacking.

I believe it is well known that the intra-intestinal bacteria can make their way through the walls of the injured intestine, and that the normal peritoneum has most remarkable powers of absorption, but it may well be doubted if the traumatized peritoneum is capable of this performance. In spite of this it seemed better to fill the abdomen with saline solution, as there was undoubtedly great risk of bowel obstruction, if the raw surfaces were allowed to fall together.

The non-absorption of the salt solution, and its infection by the colon bacillus were phenomena which were neither unexpected nor unnatural under the circumstances.

# URETERITIS CYSTICA CHRONICA \*

REPORT OF A CASE WITH BILATERAL DOUBLE URETERS

BY BOND STOW M D

OF NEW YORK

Pathologist to the Metropolitan Hospital

THE object of this short paper is to review the conclusions reached on this subject by well known authorities and particularly to invite consideration to some recent experimental work by Dr R Gianti of Turin Italy which throws considerable light on this much debated pathological problem

The subject is one that has proven thus far solely of pathological interest although the writer sees no reason why under certain conditions a skilled cystoscopist should not detect this condition during life

Morgagni<sup>1</sup> Rayer and Rokitsansky<sup>2</sup> were the earliest writers to mention this affection the latter describing the same in the following clear concise manner

In the mucous membrane of the urinary tract especially of either ureter generally in large numbers and groups there sometimes arise cysts varying in size from that of a grain of wheat to that of a pea and others of microscopical dimensions They contain a thin serous or thick colloid clear or yellowish brown fluid or gluey resinous clumps

Virchow<sup>4</sup> maintained that these cysts are true retention cysts the same as the ordinary mucoid cysts of the vagina and are caused by a closure of the crypts of the mucous glands of the bladder and ureter

Litten<sup>5</sup> was the first to give a careful microscopical study of these cysts and concludes without reservation that the inflammatory catarrh of the mucous membranes of the ureters led to a closure of its crypts and glands retaining within their lumen their secretions thus leading to a cystic formation

Why these cysts occur so rarely in comparison to the

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\* Read before the New York Pathological Society Feb 13 1907

great frequency of inflammation and catarrh of these mucous membranes he explains on the ground of the very wide openings of these crypts and the scarcity and uncertain distribution of the glands in these mucous membranes

R v Limbeck,<sup>6</sup> as early as 1887, gives an accurate description of this disease and its etiology as judged in the light of Giani's experiments, to be explained later on. He mentions two ways whereby these cysts take their origin

First, through a union of folds of the proliferating mucous membrane, and second, by a budding process of its epithelium with later a central degeneration and liquefaction of these newly formed epithelial nests and sprouts

That glands might possibly occur in these mucous membranes and thus by closure of their exits become a source of these cysts he does not deny, but he states that he with many others has failed to find any such glands

The English writers, Silcock,<sup>7</sup> Eve,<sup>8</sup> Clarke,<sup>9</sup> Bland-Sutton,<sup>10</sup> have accurately described cases of this affection and have drawn particular attention to certain peculiar round or ovoid bodies that are constantly found within the cystic contents, which bodies they interpreted as forms of sporozoa

Clarke claimed to have found bodies with large nuclei, a well-marked network, and a nucleolus, conditions only compatible with a perfect state of vitality of cell life. He believed there was an appearance as though the cell was in the process of mitosis, although he failed to discover any mitotic figures. He thought it highly improbable that such bodies arose from degenerated epithelium and strongly maintained that they were some variety of protozoa and the direct cause of this disease

Prof G Pisenti<sup>11</sup> describes a case of cystic pyelonephritis, the right ureter containing numerous irregularly distributed cysts, and the left likewise, though fewer in number. The neck of the bladder also possessed numerous thickly placed small cysts whose contents were a clear fluid. In these various cysts he found the same bodies interpreted by the English writers as protozoa, and he coincides with them as regards their etiological importance. He offers no proof that he ever discovered

any signs of life in these bodies or that by experiment he was able to reproduce the disease through their agency. His conclusions are simply based upon microscopical observations whereby claiming not to have found within these cysts any transition forms of epithelium he concludes that these peculiar bodies must be of parasitical and not cellular origin.

V Kahlden<sup>12</sup> in an exhaustive monograph on this subject also concludes that in his case the histogenesis rests upon a parasitic basis although he does not definitely attempt to classify these supposed parasites but simply states it as his belief because of the great similarity between the bodies he found within these cysts and the myxosporidia (a psorosperm found in the bladders of fishes particularly the pike) that therefore they are either a variety of this class of sporozoa or identical with them. He produces no evidence to support his conclusions from artificial cultivation of these parasites nor from the reproduction of this disease through their agency by inoculation of lower animals.

One fact opposing the parasitic origin of this disease and prominently claiming our attention is that no one as yet has found any of these protozoa in or among the epithelial cells of the mucous membrane of the genito-urinary tract or even the cells lining the walls of these cysts. They always appear in the colloidal mass within the cysts. It certainly seems reasonable to expect to find them occasionally (if only by accident) in or among the cellular epithelium when they are present in such large numbers and are supposed to be the causative factor in the formation of these cysts out of the epithelium of the mucous membrane of this tract.

A v. Brunn<sup>13</sup> studies on the normal mucous membrane of the genito urinary tract have proven of great service in elucidating this problem by showing the existence of certain epithelial bodies found beneath the superficial layer of cells of the mucous membrane either disconnected therefrom or in direct continuance with the same. He claims that they are in no sense secretory glands as was formerly held by Virchow and Litten since they fail to show a constant exit duct or

central lumen, which is generally present in most glandular structures, and that there is never present within these cells any of those changes frequently observed in glandular organs while functioning. He believes these cellular accumulations are the result of a simple budding process of the normal mucous membrane, due to an excessive stimulation and consequent proliferation of the surface epithelium. When these bodies are not disconnected from the surface he speaks of them as epithelial buds or sprouts, and the others, disconnected by an intervening layer of connective tissue, as epithelial cell nests. It is from these cellular formations, he maintains, that the condition of cystitis and ureteritis cystica chronica arises.

Lubarsch<sup>14</sup> strongly contends against the parasitic origin of these cysts and agrees with v. Brunn, as he has observed all stages of degenerative transition of these epithelial cell nests from solid to complete cystic formations. Clear and forceful is the conclusion to be drawn therefrom, that this is the true origin of these cysts, the two things necessary being the presence of v. Brunn's cell nests and the continuous action of some injurious agent, the most frequent being inflammation arising from the existing calculi. The cysts arise by, first, a destruction of the centrally located cells, out of which later is formed a colloid and granular detritus. Since this material finds no exit, by its increment the cyst increases in size until there is but a single layer of epithelial cells that bound the lumen of the ureter. He concludes from microscopical examination and the peculiar action of stains on these cell contents that the same is not a true secretion, but simply a colloid mass originating from degenerated epithelium.

Lubarsch by no means thought that this was the sole method of origin of these cysts, for at the close of his article he really speaks of three ways—namely, those cysts that arise from the closure of mucous crypts as described by Virchow and Litten, those that come from a degeneration of v. Brunn's cell nests, and those that are found at the trigone of the bladder, due to misplaced prostatic glandular tissues.

Aschoff's<sup>1</sup> extensive studies on the mucous membrane of the genito-urinary tract would go to prove that in the newly born and those of early life no epithelial budding of the mucous membrane or cut off epithelial nests as described by v Brunn and Lubarsch can be found in the genito urinary tracts and even in adult life he found them to be very inconstant and chiefly confined to the upper third of the ureter

Marckwald<sup>16</sup> found cystitis and ureteritis cystica in the newly born and claims as does Aschoff that an inflammation is not first necessary to originate these cell nests and cysts

Stoerk<sup>1</sup> on the other hand after a most painstaking and exhaustive study of this subject differs from v Brunn in that he claims these cell buds and nests are secretory in nature as well as their contents and that it is by the retention of their secretions that a transformation of these gland like cell nests into cysts occurs

He also differs from the views of Aschoff and Marckwald in that he strongly maintains that there must be first an inflammatory reaction to cause these cell nests even though traces of such a reaction may have entirely disappeared from present view. He draws attention to one very significant fact that certainly requires explanation which is that during extra uterine life nowhere in the body in any of the other mucous membranes can any analogy to v Brunn's findings be discovered. What explanation can be offered that the mucous membrane of the genito urinary tract solely and frequently undergoes this proliferating budding process?

Giani<sup>18</sup> in a purely accidental way was surprised to find a condition simulating in every respect cystitis and ureteritis cystica chronica caused by some experiments he had instituted for a study of tuberculosis of the genito urinary tract. He performed a suprapubic cystotomy upon rabbits and placed within the bladder some gelatin capsules containing a pure culture of tubercle bacilli. The external wound and bladder healed regularly. Free passage of urine occurred a few hours after the operation. In one case about 30 days later the capsule was passed through the urethra. In all the other cases the



capsules became the seat of salty incrustations from the urine, and were the centres of well-formed and quite large calculi. The rabbits, twelve in all, were kept alive from fourteen days to three months. After fifteen days he discovered a chronic cystitis, and scattered here and there in numerous places the mucous membrane showed marked tendency toward proliferation of its epithelial cells in more or less bud-like processes dipping down into the stratum proprium. Later these became wholly separate from the mucous membrane. Still later he found degeneration and liquefaction taking place within their centres, and thus the beginning of a small cyst. These epithelial submucous nests varied very materially in size. Sometimes they remained throughout one solid mass of epithelial cells. Complete cystic formation rarely occurred before the fortieth day, from which time on they increased considerably in size and number. He universally found these cysts, in toto or in part, filled with a fine granular detritus composed of red blood corpuscles, leucocytes, fragments of nuclei, and broken-down epithelial cells. Besides these, he frequently found in these cystic contents peculiar bodies, whose form was generally round or elliptical, averaging in size about 20 to 25 micra, though sometimes they were as large as 40 and some were as small as 7 or 8. The protoplasm of these bodies possessed no particular structure. It was more or less coarsely granular and refractory against aniline dyes, having a hyaline, almost glassy, appearance, coloring intensely with eosin. Sometimes they contained no nucleus, then again he found a body simulating a nucleus, which stained deeply with hematein.

This description corresponds very closely to that of the so-called parasites (protozoa) supposed to have been found in the cysts by certain English and Italian writers and claimed by them to be their cause. Such bodies were found only in the cysts and never free in the epithelium of the mucous membrane, nor in the solid cell nests above spoken of and out of which cysts eventually arose, nor in the cell accumulations on the surface of the mucous membrane.

In the light of these experimental findings it is not possi-

ble further to give credence to the parasitic origin of this affection. The chronic irritation due to the inflammation set up by the capsules that acted as foreign bodies seems an essential etiological factor.

Giani found the cysts greatest in number where the irritation would appear to have been the greatest.

Further experimentation by ablation of the mucous membrane of the bladder by a Volkmann sharp spoon produced similar results.

Giani also observed in the case of hypertrophy of the prostate where the middle lobe was removed by suprapubic cystotomy that the mucous membrane of the bladder over this lobe was covered by numerous epithelial indentations and epithelial nest formations in the submucosa either isolated or in direct communication with the surface epithelium. These undoubtedly arose from chronic irritation of the mucous membrane of the bladder at this part due both to the hypertrophic middle lobe of the prostate and the daily repeated catheterizations which had taken place for the past three years.

In conclusion one question appears difficult to answer and I cannot help but believe that there is still a very important factor in the etiology of this disease that is yet to be explained.

Ureteritis cystica chronica is a very rare affection. Lubarsch in over 3000 autopsies met the condition but four times. The writer's experience which certainly covers many hundreds of autopsies has met with the condition but once the specimen shown in figure 1. I find in the entire literature not over 50 cases reported.

If we are to believe that inflammatory irritations of mucous membrane of the genito urinary tract set up a proliferation of its epithelial surface so that buds and cell nests are formed out of which later cysts are formed then why knowing as we do that inflammation of this tract is of very frequent occurrence is cystitis and ureteritis cystica chronica so rarely met with? There are several cases reported in the literature of double ureter on one side in which this affection was found.

The specimen which is the basis of the present communication is one of bilateral double ureters in which there is complete cystic degeneration of all four ureters. So far as I have been able to glean from the literature, it remains the only specimen of its kind. The cystic degeneration in this case is confined to the ureters. Why?

Is the presence of ureteritis cystica in these cases of reduplication of the ureter purely a concomitant circumstance, or has the congenital malformation some etiological significance?

I am not able to answer these seemingly pertinent questions.

Microscopical examination of many sections showed all the finding of the authors above reported, especially the round and ovoid bodies in the cyst contents, the budding sprouts and cell nests in the mucous membrane of the ureters with degenerated cell and detritus material in their centres. Nothing was observed that would appear to enhance further the microscopical findings already reported, illustrations of which are plentiful in the literature herewith appended, nor to throw new light on the etiology of this much-vexed problem.

*Clinical History*—Anna Pahl, 40, Hungarian, houseworker. Admitted to Metropolitan Hospital, New York, May 17, 1906. Died, May 22, 1906, 9 25 A M.

Family history negative. Does not use alcohol. Moderate tea and coffee drinker. No drug habits. Had usual diseases of childhood. Had an attack of articular rheumatism in adult life. No history of any venereal diseases. For the past three years has been complaining of her stomach. Refuses solid food. Says same causes her much distress. No history of any vomiting. No localized pain anywhere in body. Poorly nourished. Subcutaneous and muscular tissues wasted. Œdema of both lower extremities. Abdomen presents a large ventral hernia. Face has a pained and distressed appearance. Complexion is generally sallow with some cyanosis. Mucous membranes congested. No œdema of face. Reflexes are all normal. Apex beat in sixth interspace and slightly to the left of the mid-clavicular line. Border of dullness to the right reaches the mid-sternal line. Slight



k L th tw d f h bl ld f b ec A B t rs lf d  
 E F tw rs right d CD ope ing l t it bl dd



epigastric pulsation. A rough systolic murmur is heard at the apex the same being transmitted to the left axilla. The second pulmonic sound is accentuated. The chest expansion is poor and appears slightly greater on the left side than the right. The apices are somewhat sunken. The interspaces are very much retracted and the ribs correspondingly prominent. Over the entire chest is heard a broncho-vesicular respiration except a small area anteriorly on the right side corresponding to about the location of the right middle lobe and the base of the left lung where no respiratory murmur is heard. Large inspiratory moist rales heard over the entire lungs. Expectoration of a thick muco purulent sputum. No tubercle bacilli. Examination of abdominal organs proved negative. Urinalysis showed light amber color 1.028 specific gravity albumin no sugar and 1 per cent of urea. Amount was 24 ounces in 24 hours.

*Diagnosis*—Mitral insufficiency with failing compensation chronic bronchitis and œdema of the lungs chronic Bright's disease.

*Autopsy*—Autopsy demonstrated the presence of chronic bronchitis passive congestion and œdema of the lungs. Unsolved pneumonia of the middle lobe of the right lung. Chronic pleurisy. Hypertrophy and advanced fatty degeneration of the heart muscle with acute endocarditis of the mitral valve. Muscular insufficiency of the mitral and tricuspid valves. Cyanotic induration of the spleen. Early stage of cirrhosis of the liver. Chronic atonic gastritis. Passive congestion of the intestines. Chronic cystitis. Ascending pyelonephritis with hydronephrosis and advanced arteriosclerotic granular nephritis. Complete bilateral reduplication of both ureters. Extensive ureteritis cystica chronica of all four ureters. The bladder contained a foul stinking greenish fluid. Its walls were intensely congested. The ureters and pelves of both kidneys likewise contained a foul stinking greenish yellow pus.

There is a reduplication of the ureter on both sides. Each of the four ureters arises from a separate pelvis of the kidney. The two ureters on each side remain entirely separate and distinct throughout (being divided by ordinary connective tissue and unite in one common exit at the usual normal ureteral opening at the trigone of the bladder. (See illustration.)

Each of the four ureters is very thickly studded from origin

to within 4 cm of their exit into the bladder by innumerable cysts varying in size from that of a millet seed to that of an ordinary pea

These cysts are both individual and massed in groups. Some are transparent and contain a clear serous fluid. Others are of an opaque greyish-yellow color containing a thick ropy colloid material. A few seem harder than the others and contain a gluey resinous-like hard substance.

The pelves of both kidneys contain likewise a few scattered similar cysts whereas the bladder is entirely free from cysts of any kind. The right kidney is very firm in consistence, of a dark mahogany brown color and weighs 62½ grams. It measures 8 by 5 by 3 cm. It is coarsely granular on its external surface and the same is studded with numerous small individual and grouped abscesses.

Its capsule is thickened and cannot be removed without adhering kidney tissue. The cut surface is granular. The cortex ranges from 1 to 3 mm. The pelves are intensely congested and inflamed. The one pelvis is in direct communication with three large well defined abscess cavities that extend to within 1 mm of the external surface of the kidney.

The pyramids are greatly distorted or entirely replaced by tough connective tissue. The blood vessels are prominent and arteriosclerotic. The left kidney weighs 93½ grams and measures 8½ by 4 by 3½ cm. Its color consistency and other characteristics are very similar to those of the right kidney. Within the kidney and in direct communication with the pelvis of the kidney are large well defined abscess cavities that contain a foul, stinking, greenish-yellow pus.

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# OPERATION FOR HYPOSPADIAS

## BY R HAMILTON RUSSELL, F R C S (ENG),

OF MELBOURNE,

Surgeon to the Alfred Hospital, Consulting Surgeon to the Melbourne Hospital for Sick Children

IN the *British Medical Journal* of November 17, 1900, I published the description of an operation that I had devised for severe hypospadias, with a photograph illustrating the result obtained, in a case on which the operation had been practised. Upon the method I was privileged to bring forward, I founded very high hopes, as will be evident to any one who may care to read my communication. Incidentally I hazarded the remark that the case reported was in my belief the best result that had ever been obtained in a case of complete perineo-scrotal hypospadias. It has been something of a disappointment to me that, since the publication alluded to, I have never seen any account in current surgical literature of a case in which my method has been adopted for the remedying of this dreadful malformation, nor does it seem to have been successful in attracting the favorable notice of surgical authors in general, despite the fact that in the last edition of Jacobson's work on the "Operations of Surgery," the method I allude to receives full description and illustration, in company with that of Duplay. The only other surgical work in which I have seen it mentioned is Cheyne and Burghard's *Manual of Surgical Treatment*, in which it receives mention in a foot-note to the description of Duplay's operation.

I desire now to suggest a modification of my method, which will, I believe, be a great improvement, and I shall seize the opportunity to redescribe the operation, as amended, with the utmost detail. My aim will be to provide any surgeon who desires to adopt this method with a trustworthy and sufficient guide in this paper. Let me frankly confess, also, that I desire to place my method side by side with that of Duplay, and claim the judgment of surgeons as to the respec-

tive merits of the two operations I would only remark further before beginning my description that in introducing a new operation for hypospadias one labors under a great disadvantage owing to paucity of opportunity for testing the method and of gaining experience in matters of technique for cases of hypospadias do not come very frequently for operation. Hence it is not altogether surprising that in the two cases in which I have had the opportunity of performing my operation the results obtained have fallen short of perfection nevertheless they are such as to convince us I think that results so excellent as to approach very near to perfection will assuredly be obtained by this method and without very much difficulty.

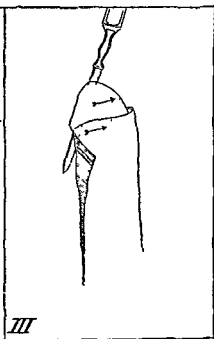
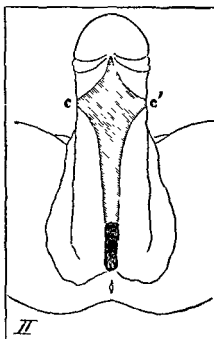
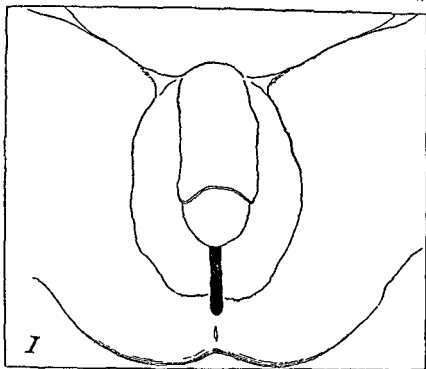
The conditions present in a case of complete perineo-scrotal hypospadias are shown diagrammatically in Fig. 1. The scrotum is cleft simulating the labia of the female the urethra opens far back in the perineum but from the orifice an open perineal urethra passes forwards as a sulcus lined with mucous membrane towards the pubic arch. At this point it terminates in a short fold of skin a kind of frænum which holds the glans penis incarcerated. The penis is thus bent into the form of an almost complete circle the frænum alone intervening between the glans and the root of the organ. From the frænum the skin spreads out fan like in the concavity of the organ to surround the corpora cavernosa. The corpus spongiosum and urethra are absent but the place of those structures is taken by short dense bands of fibrous tissue which are met with in the operation and will be duly referred to. In the peno scrotal form of hypospadias the urethral orifice will be immediately in front of the scrotum but the penis will be malformed and incarcerated in the same manner as in the more complete form just described. It will also be amenable to operative treatment such as I am about to describe with only such modifications as are obvious. In the milder penile forms of hypospadias in which the organ is perfectly free and in which there will be no obstacle to its utility as a sexual organ no operation is in my opinion called for.

*The Two Aims of the Operation*—It is obvious that the

victim of hypospadias suffers from two grave disabilities. He can never be capable of sexual congress, and he will be unable to micturate as other men perform that act. The two aims of the operation must therefore be (1) to release the organ from all its bonds, so that when erect, it shall be straight, and (2) to continue the urinary channel forward from the perineal opening to the end of the penis. My method consists of two operations. At the first operation, the penis is released and straightened and the glandular portion of the urethra is formed, and lined with preputial skin. At the second operation, the perineal and penile portions of the urethra are formed and closed, so as to complete the channel from the perineal opening to the glandular urethra. For this operation, suprapubic drainage is employed. A year or more should be permitted to elapse between the two operations. In all the diagrams, the mucous membrane of the open perineal urethra is represented black, the shaded areas represent raw surfaces.

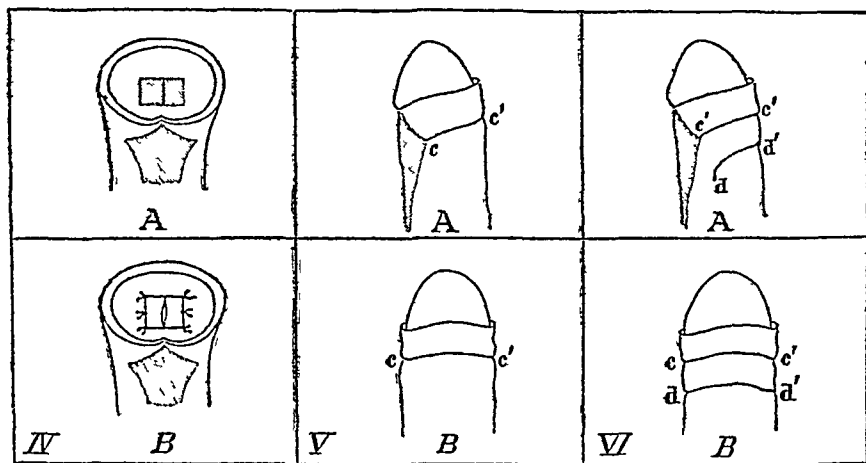
*First Operation*—Preparatory to the operation, the patient, if a child, should be put into a double long splint for a day or two beforehand. The position at the operation will be the extreme lithotomy position, with the buttocks well raised on pillows to suit the surgeon's convenience. The steps of the operation are indicated by Roman numerals.

I The glans is seized in a suitable tenaculum and drawn upwards with the left hand. The surgeon feels the fan-like frænum of skin binding down the penis and divides it transversely, liberating the glans. He continues the division of the skin freely on both sides until the body of the organ is reached, it will then be only partially straightened. He now finds the organ held down by dense fibrous bands, which occupy the place of the corpus spongiosum in the concavity of the penis. The more prominent of these bands are dissected out clean, and any remaining portions, together with tight portions of the sheaths of the corpora cavernosa are snipped with scissors, as they are felt to be made tense by the upward traction on the glans. This process is continued until the penis is completely released and can be drawn out straight. The result of this proceeding will



be the long diamond-shaped raw surface represented in Fig 2, the lateral angles of the diamond ( $C C'$ ) are formed by the ends of the transverse cuts through the fan-like frænum. Note that the transverse incisions must be so directed as to bring the lateral angles moderately high up near the glans and not down near the root of the penis.

II The cutting of the channel through the glans for the reception of the glandular urethra (Fig 3). Take a fine knife, and, holding the glans firmly in the left fingers, enter the knife at the tip of the glans where the floor of the meatus is to be, and thrust it through until the point emerges in the apex of the raw surface, just at the base of the glans. The edge of the knife is towards the dorsum. Cut freely towards



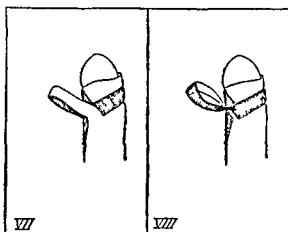
the dorsum as the knife is being withdrawn (as indicated by the arrows in Fig 3)

III Raw a small area of the glans on either side of the new meatus, this may be done by grasping the glans firmly and shaving off a fine layer that includes the meatus (Fig 4, A). In these two diagrams (Fig 4, A and B) the meatus is drawn much too small. The incision of the glans should be much more free than is here shown.

IV The first step in the cutting of the preputial loop with which the glandular channel is to be lined. Carry the knife

from one lateral angle to the other (c to c ) across the dorsum of the penis giving the incision a slight curve upwards as in Fig 5 A and B

V Second step in the cutting of the loop Parallel to the last incision make another below it (d to d ) as in Fig 6 A and B but in this case neither extremity of the incision is to reach the raw surface but will rather take a slight deflection downwards at either end as represented in Fig 6 A Thus the dorsal loop of prepuce marked out by these two incisions retains a substantial connection at either end with the skin of the body of the organ The width of this loop should be one fourth to one third inch according to the size of the organ



VI Detach this loop from its bed until it can be lifted up and passed over the end of the penis (Fig 7)

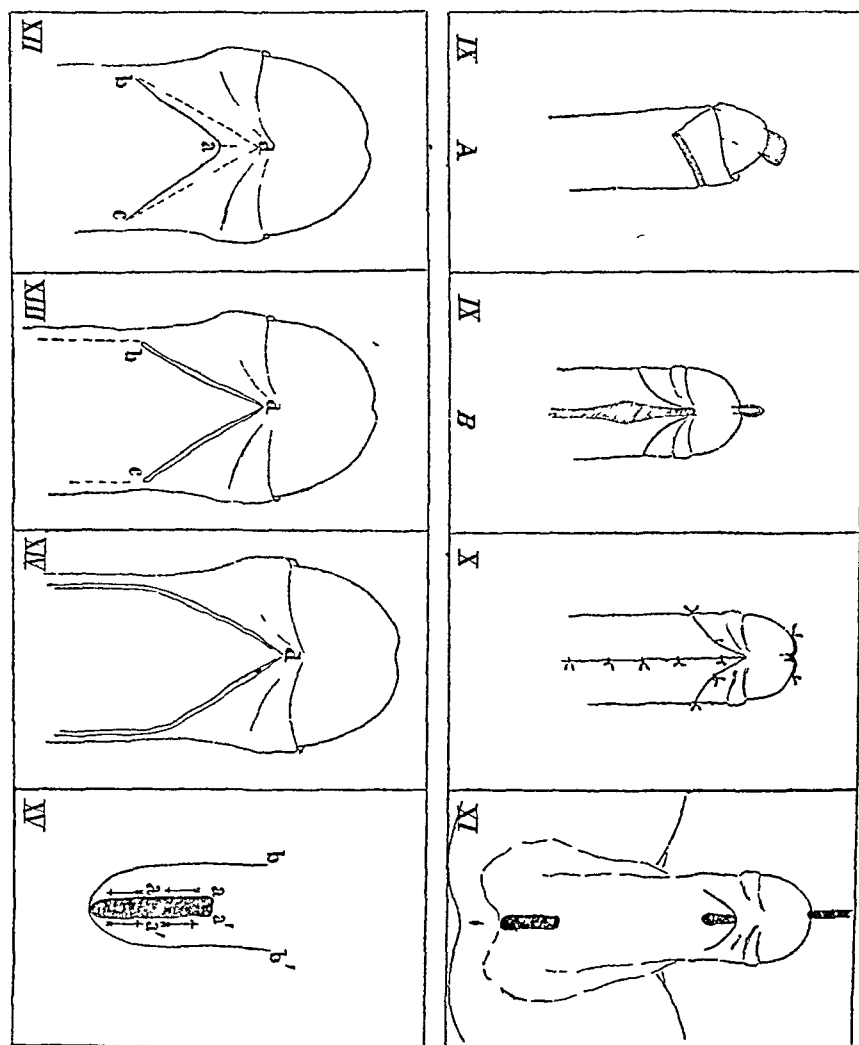
VII Turn the loop inside out so that the cutaneous surfaces are opposed to one another (Fig 8 )

VIII Pass a sinus forceps through the channel in the glans seize the loop and draw it through (Fig 9 A and B )

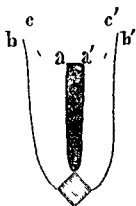
IX The loop now protruding from the end of the glans is to be divided and the two strips laid down over the raw surfaces on either side of the meatus as shown in Fig 4 B They are neatly affixed with sutures and the redundant portion

of each strip removed. The result of this step is portrayed in Fig 10.

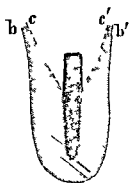
X It will now be found that all the skin edges will fall



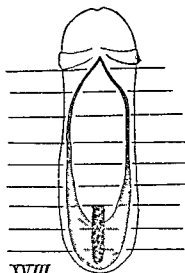
nicely into position, and are easily adjusted with sutures. The drawing of the loop through the glans will be found to have brought the lateral skin edges close together over the large raw surfaces, while the triangular flaps of skin attached to the



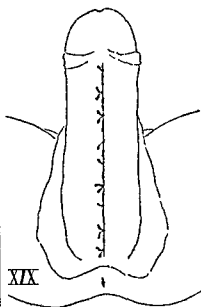
XVI



XVII



XVIII



XIX



glans will fit readily into the angle made by the loop with the skin of the body of the organ (Fig 10) A narrow bandage of iodoform gauze wound a few times round the organ makes a suitable dressing

The child is put back into the splints on returning to bed and a rubber self-retaining catheter passed into the bladder through the perineal opening In a patient old enough to be trusted, it would suffice for the catheter to be passed at intervals No rod or any such appliance is to be placed in the glandular urethra The reason for step III and the subsequent bringing of the strips of prepuce that line the glandular urethra well over on to the surface of the glans (step IX, Fig 4, A and B) may require some explanation It is designed to obviate the contraction of the meatus that will follow if the urethra terminates in a cicatricial ring, exactly at the meatus By this device, stricture of the meatus is completely prevented

The final result of this operation after healing has taken place is depicted in Fig 11, in which a bougie is shown passed through the glandular urethra

*Second Operation*—The problem is now to construct a perineal and penile urethral channel that shall be continuous posteriorly with the existing urinary channel, and anteriorly with the new glandular urethra The operation is divisible into the three following stages, which will be described in the order named

I The preparation of the anterior penile urethra and the point of its junction with the glandular urethra

II The preparation of the posterior penile urethra and the point of junction with the existing channel

III The final closure by suturing

Suprapubic cystotomy must be performed and the bladder efficiently drained, this may be done as a preliminary measure, or preferably (I think) left until the second stage has been completed, prior to the suturing A pair of fine ophthalmic scissors and toothed forceps I have found very useful The steps of this operation, which are not quite so easy to describe or to follow as those of the first, are as follows

I Starting anteriorly note in Fig 12 the two folds of skin (ab ac) that diverge from the opening of the glandular urethra to be lost on the body of the penis these are guides for the direction of incisions for making the penile urethra

Fig 12 represents this region enlarged for clearness of demonstration a is placed at the urethral orifice beneath the apex formed by the two folds of skin ab ac.

Make first the short incision ad which slits up the new urethra for about one-eighth inch This will make the angular flaps dab and dac Mentally complete the two triangles dab and dac by the dotted base lines db and dc

II With fine forceps and scissors seize each triangle in turn and cut it away along the base lines db and dc respectively The appearance will be that portrayed in Fig 13 which shows the cut edges of the two layers of skin of which the folds are composed the inner layer is part of the preputial loop which has become the lining of the glandular urethra the outer layer is continuous with the skin of the body of the penis

III Start the lateral incisions for the penile urethra from the points b and c respectively and carry them down the penis as indicated by the dotted lines (Fig 13) It is clear that the penile urethra will be perfectly continuous with the glandular portion (Fig 14) We now leave this part of the field and turn to the perineum Draw apart the cleft scrotum and observe the two following landmarks which are represented enlarged and very diagrammatically in Fig 15

(1) The fine ridge or crest (a a) that separates the mucous membrane of the perineal urethra abruptly from the skin of the perineum (Note that I wish a a to indicate not the short straight line at the anterior extremity of the urethra but the long u shaped a a that passes backward round the urethral orifice and forward again as indicated by the little arrows in the diagram)

(2) The surface line of the skin of the perineum (b b) which overlaps a a posteriorly more than is shown in the diagram Between these two lines a a and b b there is an area of skin broad behind and gradually narrowing anteriorly

that is to be removed, leaving a raw surface. Proceed as follows

IV A short median incision backward through the skin only, so as to completely expose to view the hinder part of the perineal urethra and the existing orifice. This incision will create the small quadrilateral raw surface shown in Fig 16

V Separate accurately the perineal mucous membrane from the skin, along the u-shaped line  $a\ a'$ . A good way to do this is to take fine scissors and clip away the thin crest that separates mucous membrane from skin along the line  $a\ a'$ . Note that this procedure must be carried forward only so far as to the point where the dotted lines meet the perineal urethra (Fig 16). At this point the mucous membrane must be left and the demarcation continued forward in the form of an incision along the dotted lines ( $c\ c'$ ). This is to obviate undue narrowing of the urethra, with which we are threatened at this spot. The line of separation between urethra and other structures having been thus laid down, dissect away all the skin intervening between  $a\ a'$  and  $b\ b'$ , as indicated by the shading in Fig 17. This will leave a broad raw surface in the perineum, narrowing as it passes forward

VI The operator must now strike a line for the lateral incisions that have been already made in the penile portion. In doing this, he for the first time seems, as it were, to leave the track and travel across country through, it may be, rather doubtful-looking scrotal tissue. He must just plan his incisions so as to make the junction of the penile with the perineal urethra uniform in calibre with the rest. Although this has been the only point in the procedure at which I have experienced some feeling of uncertainty, healing has been quite satisfactory in this part in both my cases

VII The entire length of the new urethra has now been marked out. The skin composing it is now to be carefully raised on either side, working towards the median line, sufficiently to permit it to fold easily over to make the new urethra, without the least tension. All is now ready for the suturing

VIII Fig 18. The new urethra and the skin of the

penis are now brought together throughout by a series of sutures. Each suture includes four layers of sl in the needle passing in order through outer sl in and urethral skin of one side then through the urethral skin and outer skin of the other. I need not dwell on the necessity for extreme delicacy and accuracy in the performance of this final step of the operation on the penile portion of the urethra which is the only part of the operation in which the result is at all precarious. The perineal portion where the surface is broad scarcely needs any suturing the sutures there will of course just miss the mucous membrane.

Fig. 19 shows the operation completed.

The penis is dressed as before by bandaging with an iodoform gauze bandage and a pad of the same material is applied to the perineum. The patient is placed in his splints with the bed foot raised. The after treatment is that of a case of suprapubic drainage. It should be possible to dispense with the drain in a week or ten days.

It will be noted that the foregoing description is somewhat different from that given in Jacobson's Operations. My experience in my second case has shown me that it is wiser to be content with forming only the glandular portion of the urethra at the first operation leaving the penile and perineal portions to be formed together at the second as I have here described. My original suggestion was to form the penile and glandular portions together at the first operation leaving only the perineal portion for the second. The new plan is the better if for no other reason than that the patient will be older and the conditions more favorable to the good healing of the penile portion of the urethra which is the only precarious part of the undertaking. Had I done this the result would I think have been perfect in the second case instead of imperfect.

*Age at Which the Operation Should be Undertaken —*

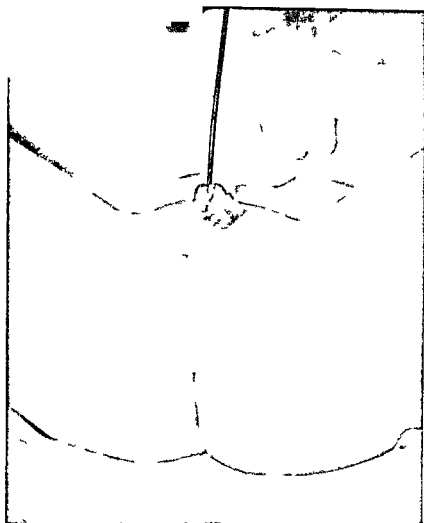
Other things being equal the larger and more substantial the parts and the tissues the better therefore the nearer to manhood the better. Social considerations however indicate strongly that the operation should be undertaken about the age

of 8 or 9 years or thereabouts, provided the parts are fairly well-developed, for it is obvious that a boy will be in a large measure debarred from association with his fellows if he is unable to micturate in masculine fashion. Under no circumstances, however, should any attempt at operation be made at an earlier age, and if the penis is ill-developed, operation must be postponed until the child is older. An operative failure will mean not merely that the operation will have to be repeated, but what is of greater importance, that any future operation will be gravely prejudiced by the presence of cicatricial tissue.

My first case has been already published (*vide British Medical Journal*, November 17, 1900), but I am enabled to give the following recent notes

*After History of Case I*—This boy was operated upon in 1899, being then in his ninth year. The result was a perfectly released penis, and complete closure of the urethra with the exception of a small hole just behind the glans. I have been fortunate in obtaining a report on his present condition through the kindness of Dr. Bush, of Rutherglen, Victoria, who visited him at my request, and has furnished me with the following interesting particulars. The boy has now turned 16 years. The glandular urethra is patent and the greater part of the urine passes through it, but some comes through the hole in the urethra, this hole would just about admit a small wax match. The left testis has descended, and is apparently normal in size and shape, and is contained in a definite scrotal sac. The right testis has not descended, and the position of its sac is occupied by a labium-like eminence seemingly composed of scrotal tissue. Dr. Bush formed the opinion that the penis would be quite efficient as a sexual organ, provided the rest of the sexual apparatus becomes normally functional, but he adds the following remarkable but somewhat disquieting particulars. The boy has developed feminine breasts, "not a mere slight swelling of the male breast, but such a breast as you would expect to find on an average 'virgin' of the same age. There is a well-developed nipple, surrounded by areola in each case, and the breast has the lobulated glandular feel of a virgin breast. The diameter of each is approximately 5 inches, and they are noticeable by their size when only a shirt

F



Ca II R 1



is worn The boy's appearance in general is feminine I had asked Dr Bush to inquire whether he had been always able to micturate in the presence of other boys or to strip in their company without the secret of his malformation being detected but Dr Bush ascertained that he had never done either of these things owing to bashfulness So far as was ascertainable by cautious questioning there did not seem to have been any kind of sexual awakening but Dr Bush very wisely did not pursue this line of investigation

*Case II*—This patient passed the first three years of his life as a girl his true sex was only discovered on his being brought to me at the Children's Hospital to be operated on for an inguinal hernia The male organ was very small but it subsequently developed well and I performed the first of the two operations for hypospadias in the eighth year The method followed was that described in my original article and in Jacobson's

*Operations* The formation of the glandular urethra was perfectly successful but the bringing together of the long flaps to form the penile urethra was not satisfactory and to this fact is due I believe the incomplete success of the second operation In fact the first operation resulted only in the formation of the glandular urethra so that I was left with the penile and perineal portions to be formed at the second exactly as I have described above but with the great disadvantage that the penile skin had been damaged The result is shown in the photo taken by my house surgeon Dr Balcome Quick (Fig 20) It will be seen that there are one or two holes in the penile urethra and I do not consider this a good result or a fair indication of what is to be expected from this method Nevertheless the boy's two great disabilities have been so far removed that it is doubtful whether it is worth while to do anything further I intend to wait until the period of puberty has passed and if he then desires it it should not be difficult to remedy the defects in his penile urethra with the aid of another suprapubic cystotomy

*Comparison with Duplay's Method*—Duplay's method consists of three operations of which the aims are as follows

- (1) The releasing and straightening of the penis
- (2) The tunnelling of the glands without any attempt to make a lining membrane to the urethra
- (3) The covering in of the perineal urethra the forming



of the penile urethra, and the end to end junctioning of the three portions of the urethra as may best be managed. It is scarcely to be wondered at that this last operation is admittedly liable to multiply itself almost indefinitely and I suspect usually to fail ultimately. I wish to be scupulously fair, but I am honestly at a loss to determine whether the success or the failure of this last part of the operation would be the greater misfortune for the patient.

Thus, I hold that the defects of Duplay's operation are that the glandular urethra is a mere sinus through cicatricial tissue, and that there is very imperfect continuity between the three portions of the urethra. Either of these defects alone would, I submit, be absolutely fatal to any claim for excellence that could be put forward on behalf of Duplay's operation. Both these objections are met in the foregoing method of two operations that I have described. Moreover, I would further point out, what any surgeon who has closely followed my description will perceive, that the two operations I have described are not really difficult. Surgeons leaning towards plastic work will easily obtain perfect results by this method.

Duplay's operation, on the other hand, is not merely extremely difficult, it is in my opinion virtually impossible. By this I mean that although doubtless the patient's condition would be greatly improved by the releasing and straightening of the penis, it is impossible to obtain a satisfactory result in respect of the urinary passage. Surgeons are always gratified at achieving successes in plastic work and pleased to display them, and there is no class of surgical cases so suitable and interesting to submit for inspection at medical societies and so forth. I have, however, never in my life known a surgeon anxious to show a result obtained by Duplay's operation for hypospadias. Is it vain for me to cherish the hope that I may hear of very gratifying results obtained by the skilful carrying out of the procedures that I have described with, I fear, almost wearisome minuteness, in this paper?

For the beautifully executed diagrams that illustrate this paper, I am indebted to my friend, Dr Oswald Shields.

# A MALE PSEUDO HERMAPHRODITE \*

BY JAMES S. STONE M.D.

OF BOSTON

Submitted by the Hospital for Children, Boston, Mass. Accepted for publication by the American Journal of Anatomy, 1906.

MARY X 2 years old living in Boston was admitted to the General Surgical Service of the Children's Hospital on March 24 1905

When 2 months old a lump had been noticed in the right inguinal region which was tender to touch. A truss had been fitted to hold back the mass but little benefit had come from its use. The child was in excellent general condition. The right inguinal canal was larger than the left. A hernial sac could be plainly felt. Occasionally a firm rounded mass appeared which was supposed to be an ovary.

At the operation for the cure of the hernia the mass was found which it was thought must be an ovary. It was so intimately connected with the hernial sac that it was excised and the wound closed exactly as in any operation for the radical cure of hernia. The convalescence was normal the child was discharged well. The report of Dr. H. C. Low given below showed the mass removed to be a normal testicle.

Specimen consists of an oval piece of tissue resembling an ovary. It is covered with a glistening membrane. It measures 1 cm. x 1.1 cm. x 0.4 cm. Attached to one side of this is a rounded cord of tissue. Although resembling an ovary the entire mass shows no sign of the Fallopian tube. Microscopical examination made from the different parts of the tissue shows that it is a testicle. The characteristic lobules and tubules of the organ are clearly seen. The epididymis is shown at one of the sections. The vas deferens and part of the corpus hyalinosum can be recognized in one part. The whole free surface is covered with a layer of flat epithelium.

*Anatomical diagnosis:* Normal testicle.

On August 16 1906 she was readmitted. A similar hernia

From the General Surgical Service of The Children's Hospital, Boston, Mass. Service of Drs. H. L. Burrell, H. W. Cushing, and J. S. Stone.

had appeared on the left side, containing a similar mass which was this time supposed unquestionably to be a testicle. Under either a most careful examination was made of the external genitals. The vagina was found to admit a probe easily for an inch. The vagina was, as is normal in a child not 4 years old, too small to admit the finger. Through the rectum it was impossible to feel any uterus or ovaries. Neither could any be felt by the finger introduced into the abdomen at the time of the second operation to be described.

The question presented was interesting. The hernia required operation. The testicle had to be dealt with in some manner.

Here was a child named and brought up as a girl for 4 years. The external genitals offered not the slightest variation from those of an absolutely normal girl. The vagina was 1 inch deep. There was no uterus. One testicle had been removed. The other testicle must be removed or left. It seemed wiser to remove the remaining testicle and allow the child to grow up as a girl without male characteristics than to attempt to undertake to convert her into a boy with one testicle and female genitals or leave her a girl with the probability that at puberty male characteristics would develop. The left testicle was therefore also excised and the hernia cured. The photographs, taken by Dr A W George, show the facial appearance and the external genitals (Figs 1 and 2). The report of Dr Low follows.

August 22, 1906.—Specimen consists of piece of tissue, measuring 1.9 cm x 0.9 cm x 0.5 cm, covered with a smooth, shiny membrane, and from one side extends a short cord of tissue, 3 mm in diameter and 1.5 cm long.

Microscopical examination shows the typical tissue of the normal testicle, the lobules, the epididymis, and the vas deferens are easily recognized. The wall of the vas deferens is somewhat thickened and there is some exudation of round cells in it. *Anatomical diagnosis*  
Testicle with slight chronic inflammatory process.



Photograph by [illegible] of Mary X

FIG 2



Photograph showing the external genitalia. Note the entire absence of the male sex characteristics

# A NEW RETRACTOR TO BE USED IN SUPRAPUBIC CYSTOTOMY

BY GEORGE WALKER, M D

OF BALTIMORE MD

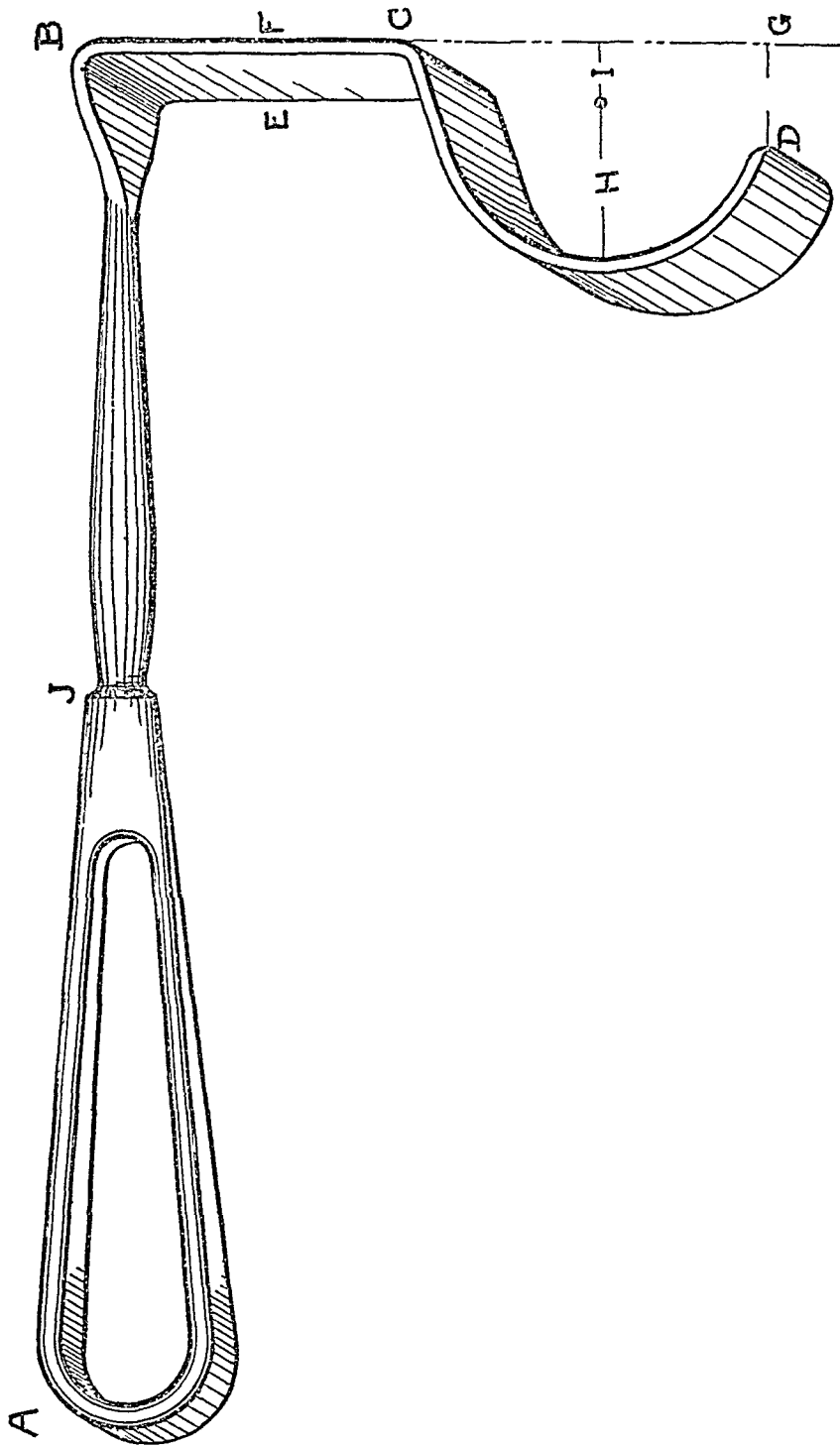
Assistant Surgeon John H. Park U. S. Army

HAVING experienced much difficulty after a suprapubic opening in obtaining a good view of the floor of the bladder by means of the ordinary retractors Dr William Fisher and I had made to facilitate this exposure a new one a cut of which is herewith given

Description of the instrument Length of the handle *a* 10.5 cm length of the whole shaft *a b* 20 cm width of blade *c f* 2 cm length of straight vertical piece *b c* 4.5 cm length of whole vertical piece including curve *b g* 9.5 cm radius of curve *h* 3.5 cm distance from lower end of straight vertical piece to tip of curve *c d* 5 cm distance from tip of curve to perpendicular drop from straight vertical *d g* 2.5 cm the lower end of the curve is cut off so as to set back and in this way gives equal retraction without obscuring the view

The size of the instrument herein described I have found well adapted for average individuals For very fat abdomens the retracting blade should be made deeper that is the straight vertical piece longer

This instrument has proved very satisfactory and much superior to the ordinary retractors It not only gives a most excellent view but by its peculiar shape it raises the floor of the bladder and makes it more accessible to the operator Three are usually necessary—one on either side and one in the upper angle of the wound



# MULTIPLE FRACTURES

WITH AN ANALYSIS OF 40 CASES AND A REPORT OF SIX PATIENTS WITH  
MULTIPLE FRACTURES OF THE UPPER EXTREMITY

BY ASTLEY P C ASHHURST M D

OF PHILADELPHIA

VERY little is to be found in systematic works on surgery on the subject of multiple fractures and though there have been isolated reports of such cases the subject it seems to me has not received the attention which it deserves My own attention has been called to it from the unusual experience of having under observation at the Episcopal Hospital during less than five years six patients with multiple fractures involving one upper extremity

Malgaigne almost alone among the writers of special monographs consecrates some paragraphs to the questions of the frequency and prognosis of cases of multiple fractures Among 2358 fractures from the records of the Hotel Dieu he found 30 cases of multiple fracture or 1.28 per cent of the whole number Among 5057 fractures which have been treated at the Episcopal Hospital within the last five years (1902-1906 inclusive) I have found records of 73 instances of multiple fractures or 1.44 per cent

According to Bruns a series of 124 cases of multiple fractures was collected by Weber Moritz and Leisrink Bruns found that among these patients the mortality was 40 per cent no cases of course being included in which the original injury produced immediate death The rarity of multiple fractures is due to this very fact that so many patients die almost immediately after the injury Among the 73 cases at the Episcopal Hospital there were 20 deaths a mortality of 27.4 per cent In calculating this percentage not only have cases of crush of



the extremities, calling for immediate amputation, been excluded from the list, but those patients admitted in a state of profound shock, and dying in a few hours without reaction, have also been omitted, so that I think it is fair to conclude that 27 per cent is close to the true mortality at the present day from multiple fractures themselves, without the added deaths that would be attributed to lesions of the brain and internal organs

For the sake of comparison, the mortality of fractures in general may be seen from the following figures, which show that multiple fractures are just about ten times more dangerous than others

PROTESTANT EPISCOPAL HOSPITAL, CASES OF FRACTURE 1902-1906

| Year  | Cases | Recovered | Died | Mortality per cent |
|-------|-------|-----------|------|--------------------|
| 1902  | 943   | 910       | 33   | 3.5                |
| 1903  | 927   | 899       | 28   | 3.0                |
| 1904  | 954   | 931       | 23   | 2.4                |
| 1905  | 1114  | 1088      | 26   | 2.3                |
| 1906  | 1119  | 1094      | 25   | 2.2                |
| Total | 5057  | 4922      | 135  | 2.7                |

Multiple fractures in general may be conveniently classified in three groups, as follows I Fractures of the skull or trunk and the extremities, *e g*, of the pelvis and the thigh, of the skull and the arm, of the spine and the foot, etc II Fractures of different extremities, including (*a*) Similar fractures, *e g*, of both legs, of both forearms, of both clavicles, etc, and (*b*) Dissimilar fractures, *e g*, of the leg and the forearm, of the arm and the thigh, of the thigh and the opposite leg, etc III Multiple fractures confined to one extremity, as of the femur and one or both bones of the leg, of the humerus and one or both bones of the forearm, etc

It is not usual to consider a fracture of two or more parallel bones, as of the ribs, or both bones of the forearm, or of the leg, as an instance of multiple fracture, still less should

a comminuted fracture or even a multiple fracture of a single bone be so considered. The latter injury is more correctly designated as a double fracture a triple fracture etc.

The accompanying table gives the distribution in 240 cases of multiple fractures which have been collected from the following sources: Malgaigne 30 cases, Index Catalogue of the Surgeon General's Office Series I 100 cases, Series II 37 cases, Records of the Episcopal Hospital 73 cases.

DISTRIBUTION OF MULTIPLE FRACTURES

|                   | M I<br>ga ga | SGO I | SGO II | PEH | T t l | P      |
|-------------------|--------------|-------|--------|-----|-------|--------|
| I Sk ll d t m t   | 7            | 13    | 8      | 1   | 39    | 16 25  |
| Trunk d extrem t  | 3            | 38    | 6      | 1   | 57    | 23 75  |
| Skull d trunk     | 1            | 8     | 3      | 1   | 13    | 5 41   |
| Tru k l           | 0            | 5     | 3      | 2   | 0     | 4 0    |
| II Dff t t em t e |              |       |        |     |       |        |
| Sm lar l ns       | 1            | 6     | 6      | 7   | 29    | 12 08  |
| D ss m l r l n    | 6            | 2     | 9      | 35  | 7     | 9 16   |
| III O t m ty      |              |       |        |     |       |        |
| Uppe t m ty       | 0            | 7     | 1      | 7   | 5     | 6 5    |
| Low e tr m ty     | 3            | 3     |        |     | 7     | 2 90   |
| T tal             | 30           | 100   | 37     | 73  | 24    | 100 00 |

In addition to the above cases Dr W J Taylor and Dr H R Wharton have each reported a case of such extensive multiple fractures that they deserve a class to themselves. Dr Taylor's patient who recovered had in the left upper extremity fractures of the humerus through the surgical neck and through the middle of the shaft and also of the radius and ulna close to the wrist while in the right upper extremity she had a *T fracture involving the condyles of the humerus* a fracture of the radius and ulna in their upper third and of the radius in its lower third. Dr Wharton's patient besides a compound fracture of the nose had a fracture of both bones of each forearm and a fracture of both thighs he did well for a week and then died rapidly possibly of fat embolism.

The mortality of the various combinations of fracture may

be seen in detail in the following analysis of the Episcopal Hospital cases

MORTALITY OF MULTIPLE FRACTURES AT THE EPISCOPAL HOSPITAL,  
1902-1906

|                                      | Total | Rec | Died | Mortality<br>per cent |
|--------------------------------------|-------|-----|------|-----------------------|
| I Of skull or trunk, and extremities |       |     |      |                       |
| 1 Skull and { Upper extremity        | 6     | 6   | 0    |                       |
| { Lower extremity                    | 5     | 2   | 3    | 60 00                 |
| 2 Trunk and { Upper extremity        | 8     | 3   | 5    | 62 50                 |
| { Lower extremity                    | 2     | 1   | 1    | 50 00                 |
| 3 Skull and trunk                    | 1     | 0   | 1    | 100 00                |
| 4 Trunk alone                        | 2     | 2   | 0    |                       |
| II Of different extremities          |       |     |      |                       |
| 1 Similar Lesions                    |       |     |      |                       |
| Both forearms                        | 3     | 3   | 0    |                       |
| Both femora                          | 2     | 0   | 2    | 100 00                |
| Both legs                            | 2     | 2   | 0    |                       |
| 2 Dissimilar Lesions                 |       |     |      |                       |
| Upper and lower extremities          | 20    | 15  | 5    | 25 00                 |
| Both upper extremities               | 6     | 6   | 0    |                       |
| Both lower extremities               | 9     | 7   | 2    | 22 50                 |
| III Confined to one extremity        |       |     |      |                       |
| Upper extremity                      | 7     | 6   | 1    | 14 30                 |
| Lower extremity                      | 0     | 0   | 0    |                       |
| Total                                | 73    | 53  | 20   | 27 4                  |

The great amount of violence which attends the production of all these fractures makes the prognosis necessarily grave, and renders the prospect of recovering useful limbs more dependent upon the character of the injury than upon the treatment employed. When the head or trunk is involved, the injury is more apt to be due to a fall from a height, or to the patient being caught in machinery and tossed against the walls of the room. It is often due to the patient being struck and thrown by a locomotive or a trolley car. In the second class the patient is more apt to have been injured by a crushing force, as the passage of a wheel over the extremities, or the fall of a heavy beam. In the third class, which is the smallest of all, and to which all of the patients reported to-night belong, falls and machinery accidents hold about equal place. In the 18 examples of this injury which it has been possible to find

recorded the cause in 4 is unknown in 7 the patients were caught in revolving machinery in 5 they were injured by falls and in 2 the accident was due to their being knocked down run over and dragged by moving vehicles

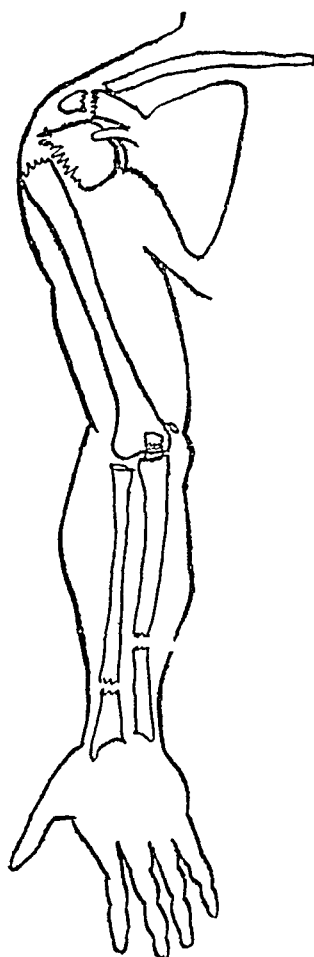
In such severe injuries as these it is frequently impossible to do more for the patients when they are first admitted than to combat the shock. Thus in one of the cases reported to-night reduction of a dislocated hip was not accomplished until the third day after admission and in another patient over three weeks elapsed before his precarious condition made it seem advisable to have him removed to the second floor for skiagraphic examination. It is on this account that accurate coaptation of the fragments cannot always be obtained as well as for the reason that the injuries to the soft parts are often of more pressing importance.

The chief difficulty in the treatment of multiple fractures involving the upper extremity consists in the fact that many of these patients are necessarily confined to bed for a number of weeks after the injury and that therefore deformity in the humerus is hard to prevent since the weight of the forearm *which is available in the ambulatory treatment of fractures of the humerus* cannot be used when the patient is confined to bed. This fact together with the absolute obliteration of all landmarks from cedema was the cause in Case I of the projection of the lower fragment at the shoulder joint so as nearly to penetrate the skin necessitating excision. In Case III the muscular contraction was so violent and spasmodic that even the use of weight extension to the lower fragment of the humerus while the patient was in bed suggested by Dr Hutchinson together with heavy shot bags over the seat of fracture was not sufficient for a long time to keep the fragments in position.

In spite of the gravity and extent of the injuries if once the patient survive the immediate effects of the accident there is no good reason why union of the fractures should not occur and the limbs prove eminently useful. Indeed Dupuytren contended that the very multiplicity of the fractures tended

to promote rapid healing, since the pain, discomfort, and inflammatory reaction are distributed among many parts, instead of being concentrated in one somewhat upon the same principle, I suppose, that it is said a man does not feel the dentist treading on his toe while his tooth is being pulled

FIG 1



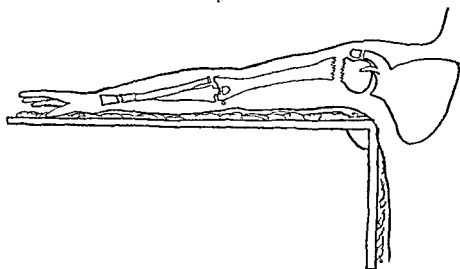
CASE I—Fracture of acromion, of surgical neck of humerus, of internal epicondyle, of olecranon, of radius, and compound fracture of ulna

Dupuytren says (I quote from Packard's translation of Maligne) "that the danger of wounds and fractures, although doubtless increased by an increase in their number, is still not in direct ratio with that number At first sight, one would

presume that several fractures complicating one another would naturally react unfavorably each one thus giving rise to graver symptoms than if it had occurred alone. Now the contrary is true when there are several fractures each one induces slighter symptoms than if it were by itself and Dupuytren after at first viewing this fact with astonishment became assured of it and looked for it subsequently as natural and to be expected. These remarks of Dupuytren prove the correctness of that saying of Heister *In prædicendis fracturarum et entibus magna utique chirurgis opus est circumspectio*

I am indebted to my chiefs at the Episcopal Hospital for permission to report the following cases. The first four in

F



C I—After is report of the fracture of the humerus and the right elbow joint

the services of Drs Neilson Deaver and Harte came under my care as resident and the two last were treated this winter in the out patient department

CASE I —Michael C 15 years (P E H No 867) admitted May 6 1902 had fallen 40 feet from the side of a ship where he was at work landing on the dock. *Diagnosis* Fracture of both bones of forearm in lower third (compound of ulna) fracture of olecranon fracture of internal epicondyle of humerus high

fracture of surgical neck of humerus, fracture of acromion process of scapula, shock The fractures all involved the right side The dressing consisted of a Bond splint, an axillary pad and a shoulder cap of binder's board, the arm was bandaged to the chest, the elbow being extended and the forearm in supination The dressings were changed every other day at first, owing to the very great œdema Ice-caps were applied to the arm from shoulder to elbow The œdema in a few days became so great that it was uncertain whether gangrene might not ensue

May 11—The œdema is less The wound of compound fracture of ulna is healing

May 22—Union progressing Bone projecting beneath skin of shoulder thought to be comminuted acromion Shoulder very black and blue No landmarks palpable yet

May 29—Anterior obtuse angled splint, and posterior straight splint to forearm Binder's board shoulder cap as before Union apparently firm throughout At normal site of coracoid process, below clavicle, is a bony prominence, apparently too large for coracoid, but it seems hardly possible that it is the head of humerus in subclavicular dislocation The comminuted acromion moves with, and seems immovably fixed to shaft of humerus

June 1—Skiagraph of shoulder joint shows high fracture of surgical neck of humerus, upper end of lower fragment almost jutting through skin below acromion The head of humerus is apparently in glenoid cavity (Fig 1) Out of bed in wheel-chair

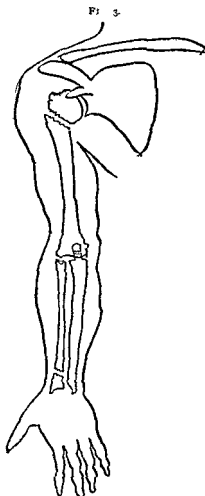
June 3—Walking about ward Four weeks since injury

June 5—*Operation* Partial excision of right humerus, by Dr Thomas R Neilson Ether Incision in line of deltoid fibres from acromion down about 5 inches Muscular fibres separated and bone bared Shaft of humerus united by fibrous union in malposition with head of humerus Fracture below anatomical neck Fragments separated, shaft turned out through wound, and about 1½ inches excised, subperiosteally, with saw and nippers End of shaft returned and fractured parts put in good position This was accomplished by abducting the arm to a right angle with the body (Fig 2) Iodoform gauze drain, silkworm gut sutures Arm dressed in semipronation, and held at right angles with body by long right angled splint Short posterior splint to forearm, and shoulder cap of binder's board

June 6—Dressings reinforced on account of bloody ooze. Much pain all night none to day

June 9—Dressed Parts in excellent condition about half of gauze drain removed The fractures of forearm show slight anterior bowing No special dressing for olecranon

June 12—Dressed Drain entirely removed No oozing



CAS. II.—Ft. of left forearm and olecranon fracture

June 15—Dressed Looped stitch at site of drainage tightened All other sutures removed

June 19—Arm put at angle of 45° with body with acute angled anterior splint in axilla Slight anterior prominence of head of humerus corrected by a pad



June 22—Out of bed While in bed lay very quietly on back The best patient I ever had

June 24—Dressed with obtuse angled internal angular splint Considerable pain in flexing elbow to this extent—about  $135^{\circ}$

June 30—Dressed with right angled internal angular splint (Physick splint)

July 2—Fergusson's dressing for fractures about shoulder No splint to forearm, which is carried in bandage sling at wrist

July 3—Discharged cured, to return to Dispensary for occasional dressings

February 20, 1907—Returned in answer to letter All functions of upper extremity are perfect, including rotation of forearm, and external rotation of humerus From the left acromion to the head of the radius measures 29.5 cm On the injured side the distance is 26.5 cm There is no visible or palpable deformity anywhere The patient, now a grown man, does heavy laboring work, and would not know his arm had ever been injured, except that it is a little shorter than the left, and he is therefore obliged to have his clothes made to order

CASE 2—E B, 38 years (P E H No 1083), admitted June 1, 1902, was a fireman, and had fallen from a ladder The height is not known *Diagnosis* Fracture of radius in lower third, fracture of the olecranon, and high fracture of surgical neck of humerus, all on the right side *Dressing* A straight anterior and short dorsal splint to forearm, the fracture of humerus being masked by great swelling

June 5—Skiagraph shows fracture of shoulder Dressed with long straight anterior splint, from axilla to finger tips, and short dorsal splint to forearm, which was held in semipronation, shoulder cap of binder's board, and arm fastened to chest by broad binder Lies on back very quietly Redressed from time to time

July 2—Out of bed, elbow still in full extension

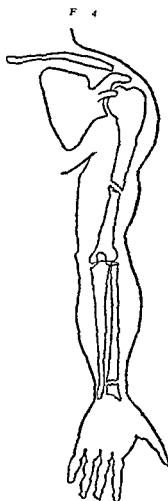
July 3—Obtuse angled internal angular splint applied, short posterior splint to forearm, and shoulder cap

July 5—Right angled internal angular splint, other dressings as before

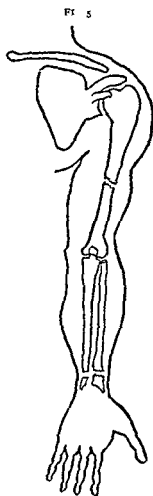
July 7—Fergusson's dressing applied Over 5 weeks since injury, all fractures firm, little deformity Discharged

It has been impossible to trace this patient

CASE 3—J C 38 years (P E H No 2029) admitted September 27 1902 was a pipe fitter and fell 40 feet from scaffolding striking earth with left arm and shoulder No unconsciousness On admission mind clear considerably shocked



C III—F t f L h m ru  
bel w sert f D lt d d C II  
f t f L rad (Al d l ca  
t f R, h p)



C IV—Fra f L h m  
ru bel w section f d lt ld  
C lies fract L rad us d  
tra re f L ina lowe fl b

*Diagnosis* Fracture of humerus below insertion of deltoid and Colles' fracture of radius both on left side dislocation of right femur into ischiatic notch where head of bone is easily felt shortening 1 1/2 inches adduction and inversion of the affected

limb Deformity of fractures easily corrected by extension and manipulation *Dressing* Bond splint to forearm, short internal splint to humerus, with shoulder cap of binder's board Dislocation of hip not reduced on account of shock

September 28—Patient has reacted well Under ether an unsuccessful attempt made to reduce dislocation by flexion and circumduction

September 30—Dr Harte, with Drs Neilson and Deaver in consultation Patient again etherized, and hip successfully reduced by manipulation and vertical traction Buck's extension and sand bags

October 1—Arm dressed Colles's fracture in good position, forearm in semipronation Fracture of humerus below deltoid in very bad position indeed, lower fragment drawn up into axilla, and upper jerking out against skin With considerable difficulty fragments were brought into position and maintained with firm bandaging of shoulder cap Hip painful Patient very restless Temperature  $100^{\circ}$  to  $101^{\circ}$  F Ordered to take potassium bromide, gr xx, every 3 hours

October 4—Dressed Humerus recurs to its deformity as soon as bandages are removed, and probably was not in good position even before unbandaging

October 5—Dr Hutchinson recommended weight extension from elbow This was applied, with forearm in full pronation, and with upper arm abducted from body to angle of  $45^{\circ}$  This dressing completely corrects the deformity Shot bags laid on top of arm, over shoulder cap Temperature nearly normal

October 10—Dressed No union in humerus, deformity is apparently fairly well corrected when shoulder cap is in place The upper fragment of Colles's fracture is in dorsal deformity, being supinated by the biceps, whereas the forearm must be kept in full pronation while weight extension is maintained Patient is extremely contrary, will not lie still, pulls off bandages, kicks sand bags on floor, and seems to do everything possible to retard his cure He has no delirium, and seems to be restless for the mere sake of aggravating his disorder

October 17—Dressed, some union of humerus Extension to arm continued Deformity less Patient very much quieter Hip extension removed Three weeks since injury

October 24—Dressed Four weeks since injury Radial union good, position good, wrist a little stiff Lower fragment

of humerus still tends to draw upwards and inwards Patient of model deportment

October 31—Extension removed from arm Five weeks since injury 26 days since extension was applied to arm Union in humerus quite firm Little visible deformity fair amount of callus Arm brought in to side of chest Bond splint left off elbow flexed with difficulty to nearly a right angle and a modified Fergusson's dressing applied During use of extension to humerus forearm was at angle of about 105° with arm and elbow is now quite stiff Sitting up makes patient faint and giddy Right knee and leg feel somewhat numb Functions normal no pain at hip

November 14—Soon after last note got out of bed and to day was discharged

February 19 1907—Returned in answer to letter Still employed at Cramp's ship yard and says his arm is perfectly useful There is no noticeable deformity There is 0.5 cm shortening in the fractured humerus none in the forearm No callus felt anywhere Can completely extend elbow but flexion beyond 80° is impossible Pronation of forearm is complete but supination is only about three fourths complete—that is to say there is rotation of about 135° instead of 180°

CASE 4—A W 65 years (P E H No 2387) admitted November 12 1902 fell against the steps of the house where she lodged while intoxicated History of accident is incomplete  
*Diagnosis* Fracture of humerus below insertion of deltoid Colles's fracture of radius fracture of ulna in lower fifth—all on the left side acute alcoholism general contusions acute bronchitis lacerated wound of left eyebrow *Dressing* Bond splint forearm in full supination elbow extended shoulder cap axillary pad arm bandaged to side Lies on back in bed

November 14—Developed delirium tremens

November 15—Dressed Fractures in fairly good position

November 17—Dressed Delirium tremens worse

November 29—Pulse failing

December 1—Chill Temperature 103.6 F

December 2—Diffuse bronchitis Dressed

December 6—Stuporous Temperature 101 F

December 7—Uræmic Urine very scanty Temperature 103.4 F Fractures united in good position

December 11 —Died Temperature  $108^{\circ}$  F

CASE 5—H D E, 57 years (P E H No 3579), admitted November 26, 1906 Was knocked down and run over by coal wagon, while intoxicated Admitted in semi-conscious condition  
*Diagnosis* Lacerated scalp, comminuted fracture of left humerus above insertion of deltoid, compound comminuted fracture of both bones of left forearm in middle third Seen in Dispensary 5 days later, with no union of any of the fractures, overlapping of fragments of humerus, and deformity of forearm Forearm was dressed in full supination, with long palmar and short dorsal splints, moulded coaptation splints of binder's board to humerus, with shoulder cap of same material, and arm bandaged to chest Wrist supported by sling Progress of case uneventful Forearm alone was redressed December 10, and whole upper extremity redressed on December 13 All fractures were then found to be knitting Redressed December 20 and December 27, on which latter date all fractures were found solid There was considerable deformity from œdema below elbow, and apparently some outward bowing of bones of forearm Only the long palmar splint and the shoulder cap were replaced

January 5 —Dressed Long splint on ulnar side of forearm, short dorsal splint, and a third splint on external (radial) surface, to overcome the outward bowing

January 8 —œdema much less Lower fragment of radius apparently united to upper fragments of both radius and ulna, leaving lower fragment of ulna partially ununited Same splints continued Skiagraph made laterally shows some dorsal displacement of both lower fragments

January 15 —Ulna seems firmer

January 22 —Radius very firm Skiagraph made antero-posteriorly confirms notes made January 8

February 1 —Ulna is decidedly firmer Rotation of about  $45^{\circ}$  from full supination Only long dorsal splint continued

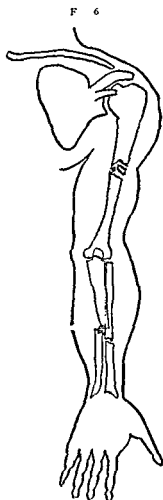
February 12 —Referred to Orthopædic Hospital (Dr G G Davis) for massage and passive motion

February 23 —Can almost make a fist Rotation a little more extensive To continue treatment

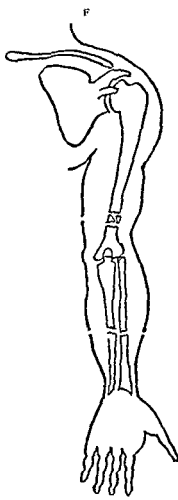
March 25 —Has been working as usual, for some weeks, at saw-making Finds little disability from injury There is considerable deformity in forearm, the bones being bowed to radial

side Rotation a little more extended Can make a fist.  
Strength is normal

CASE 6—A M 14 years (P E H No 3860) admitted  
December 22 1906 Caught in belting carried around and  
thrown to ground *Diagnosis* Compound comminuted fracture



C V—C mm ted fra t  
f L h m ru bo i sert f  
d lt id compo d comm t d  
fra t f both bon f L f e arm



C VI—C mpo d comm ed  
fra t f L h m l w h rd  
compo d fract re f both bo es L  
f rn

of left humerus in lower third compound comminuted fracture of  
both bones of left forearm at junction of middle and lower third  
Seen in Dispensary nine days later Some union in forearm but

both bones were bowed to ulnar side No union in humerus, the lower fragment being drawn up and back by triceps, upper fragment being pulled forward and in by deltoid and muscles of axillary folds Dressed precisely like Case 5

January 9—Dressed Position of all fragments excellent Wound over inner surface of humerus healing, that over ulna scabbed Fair union in all fractures

January 16—Dressed All fractures firm Moderate amount of callus over humerus, wounds all healed solid Rotation of forearm from full supination to mid-pronation good

January 23—Dressed

January 30—Dressed Long dorsal splint and shoulder cap only All fractures solid, and motions good

February 6—To wear only a handkerchief sling All functions perfect, except extension of elbow, which is possible only to  $140^{\circ}$

February 16—Elbow can be extended to  $150^{\circ}$

March 2—Arm normal in every respect, but elbow can be extended only to  $165^{\circ}$ , owing to callus around comminuted fracture of humerus

N B—Patients 1, 5 and 6 were exhibited to the Philadelphia Academy of Surgery, April 1, 1907

For the sake of completeness the following abstracts of cases of multiple fractures confined to one upper extremity are added These, with the six original cases just reported, comprise all examples of this injury it has been possible to find

7 ALQUIÉ (Gaz Med de Montpel, 1846-1847, vii, 84) Fracture of clavicle and humerus (Access has not been had to this journal)

8 BLUM (Arch Gen de Med, 1887, xx, 214) Patient caught in revolving wheel compound comminuted fracture of left humerus, fracture of left radius, and compound fracture of left ulna Shoulder joint amputation on third day for traumatic emphysema Recovered

9 DAVIS, G G (Records of Episcopal Hospital, Phila, No 320 of 1906) Male, 14 years, caught in revolving machinery Admitted January 27, 1906 Shock, transverse fracture of left humerus in lower third, fracture of both bones left forearm in upper third, compound fracture of both bones left forearm in lower third, compound fracture of several fingers Dressed on posterior splint, irrigation for 1 week Recovered with good rotation of forearm, and flexion and extension of elbow Discharged March 8, 1906

10 GREEN (N Y Med Record, 1880, xvii, 538) Caught in a re-

volving wheel fracture of left humerus through surgical neck and in lower third fracture of left ulna in upper third compound fracture of left radius and ulna in lower third Dressed in plaster of Paris elbow in full extension for a week then flexed to right angle. Recovered with good functions

11 LABORIE (Bull. Soc. de Chir. de Paris 1866-1867 2 sér. vii 297) Patient seen 3 months after injury which had produced multiple fractures of right scapula clavicle and humerus and a posterior dislocation of right shoulder. Fractures all had united except in humerus, where false joint persisted

12 MARIANI (Rev. de Med. y Cirug. pract. Madrid 1882 v 110) Double comminuted fracture with wound of forearm and arm. (Access has not been had to this journal)

13 NICHOLLS (Lancet, 1873 i 877) Knocked down and dragged by horses fracture of left humerus above deltoid compound fracture below deltoid posterior dislocation of left elbow and fracture of both bones left forearm in middle third. Dressed in full extension for three days splints then abandoned on account of œdema. Recovered with much deformity and poor function

14 PACKARD (Internat. Encyclop. of Surg. Ashhurst, Revised Ed. N. Y. 1888 V iv p 18) Male 22 years caught a round revolving shaft fractures of humerus radius ulna and metacarpus. Recovered with almost perfect functions

15 PEZEVAT (Jour. Compl. du Doct. des Sc. Méd. Paris 1831 xl 276) Caught in revolving wheel fracture of left clavicle posterior dislocation of left elbow and fracture of both bones of left forearm in lower third. Arm laid on pillows recovered with fair function

16 ROBERTSON and FIFIELD (Bost. Med. and Surg. Jour. 1877 xcvi 570) Fall fracture of right humerus above condyles Colles fracture of right radius. Dressed in full extension good recovery

17 SCHWARTZ (Bull. et Mem. de la Soc. de Chir. de Paris 1904 xxx 1102) Fracture of surgical neck of humerus and fracture of lower extremity of radius. Plaster cast to forearm and on sixteenth day after injury weight extension to humerus. Union reported progressing

18 Since the above was written there has been admitted to the Surgical Dispensary of the Episcopal Hospital another patient with multiple fractures of the upper extremity for notes of which I am indebted to my Resident Dr. Price. Male 20 years was caught in a revolving shaft on March 16 1907. He sustained fractures of the left humerus in lower third and of both bones of left forearm in middle third. He was treated precisely as were Cases 5 and 6 progress satisfactory

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# FRACTURES OF THE HEAD AND NECK OF THE RADIUS

BY T TURNER THOMAS, M D,

OF PHILADELPHIA,

Instructor in Surgery in the University of Pennsylvania, Assistant Surgeon to the University  
and Philadelphia Hospitals

THAT fractures of the head and neck of the radius occur occasionally has been demonstrated positively by dissection, but that they are more than surgical curiosities will probably be disputed by many. Skiagraphic evidence collected by the writer<sup>1</sup> tends to show that they deserve a place among the common fractures.

It is remarkable that so important a fracture should have escaped the attention of the profession until 1834, when Berard<sup>2</sup> discovered the first reported case, at autopsy, almost by accident. In 1880 Bruns<sup>3</sup> could collect only 21 cases from the literature, 20 of which had been proven by anatomical investigation, and in 1905<sup>4</sup> the writer could find only 48. In skiagraphic collections in Philadelphia 55 more were discovered.

The essential facts concerning vertical fracture of the head, to which the writer has called attention, may be briefly summarized as follows. The approximation of the fragments may be so close that the skiagraph may fail to show the line of fracture, especially if the rays are directed in an incorrect plane. It is always intracapsular, and frequently fails to give crepitus or deformity, the fragments moving together as one piece within the closely fitting orbicular ligament. In a fall on the hand with the elbow extended only the anterior part of the radial head is in contact with the humeral condyle, and when the head is fractured it is this part which is broken off. Since the forearm is almost always in pronation in a fall forward on the hand, and since most falls on the hand are forward, the

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<sup>1</sup> University Medical Bulletin, September and October, 1905

<sup>2</sup> Diction de Med, 1835, en 30, vol t lx, p 228

<sup>3</sup> Centralblatt f Chirurgie, 1880, vol vii, p 353

same part of the head is broken off in most cases. Although the X ray when available should always be employed the diagnosis in an uncomplicated case may be made by the symptoms. A history of a fall on the hand is important. The resulting swelling will not be commensurate with the degree of pain and impairment of function and will be most marked on the outer side of the elbow. Exclusion of fracture of the humerus, ulna and shaft of the radius will be possible without great difficulty. There will however be severe pain and tenderness localized to the head of the radius and limitation of all the movements of the elbow will be evident more particularly of pronation and supination. Crepitus when present is not marked. Ankylosis of all the movements of the elbow more or less marked during the first month or two following the fracture is almost pathognomonic.

Dr Henry K. Pancoast, skiagrapher to the Hospital of the University of Pennsylvania, has kindly placed at the disposal of the writer his collection of skiagraphs of this fracture. Because of the absence of histories in most of the cases and the obscurities necessarily associated with the skiagraphs positive conclusions are reached with some difficulty. The greatest difficulties arise from the close approximation of the fragments and the fact that the fragments moving together as one piece within the orbicular ligament it is exceedingly difficult to determine with anything like accuracy in what direction the line of fracture runs. It is thus evident that in directing the rays for the exposure of the fracture there is considerable risk that no fracture will be shown by the skiagraph. The skiagraphs which illustrate this paper will however emphasize forcibly some important points *e.g.* the close approximation of the fragments and the absence of deformity. We have only to imagine the closely fitting orbicular ligament in position to obtain a sufficient explanation for these conditions and for the frequent absence of crepitus. The writer would call particular attention to the relative frequency with which the faint line of fracture is shown by a lateral exposure of the elbow to the X ray although it is more

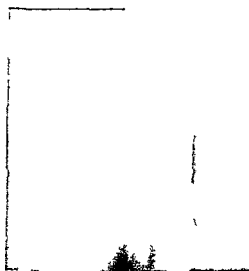
or less obscured by the coronoid process of the ulna. An effort will be made later to explain the advantages of this position.

When the writer read his first paper on this subject before the State Medical Society of Pennsylvania in 1906, Dr Pancoast reported that he had skiagraphs of 19 cases. Those for 23 are now available, while several more have been loaned to physicians who have not yet returned them. He considers that he has now about 30 in all. Of these 23, 11 may be positively included among the vertical fractures of the head. Five more are probably of the same type, 2 are injuries of the upper epiphysis of the radius, and 5 are fractures of the neck.

Of the 23, 10 are uncomplicated fractures of the head and 3 are uncomplicated fractures of the neck, while the two cases of epiphyseal injury are also uncomplicated. Four are complicated by posterior dislocations of the elbow, and one by an anterior dislocation of the radius. Two are complicated by transverse fractures of the humeral condyles. These figures corroborate to a marked degree the facts already shown by the literature.

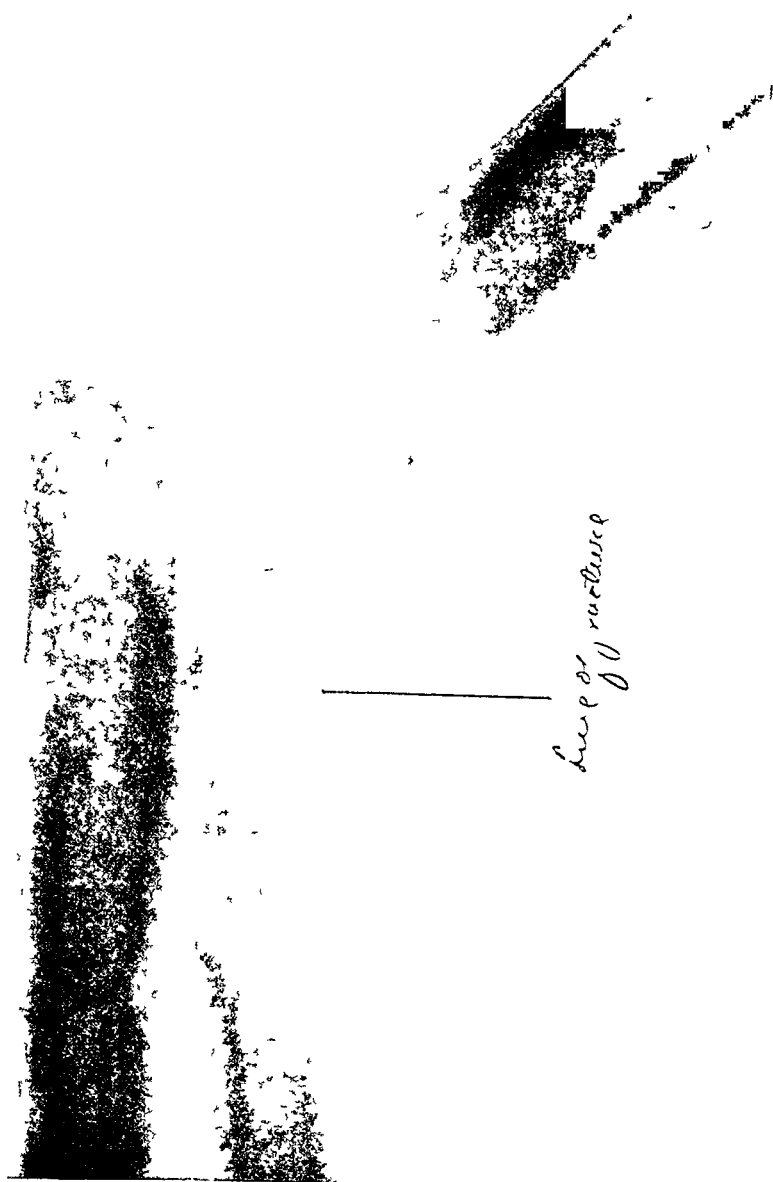
In about 7 of the uncomplicated fractures of the head, so far as can be judged from the skiagraphs, the small detached fragment is anterior in the prone position of the forearm. In the 4 cases complicated by posterior dislocation of the elbow, the fragment is anterior and below its normal position. The writer concludes that it was driven downward by the impact of the condyle, when the forearm was in pronation, as in a fall on the hand.

In order to emphasize more forcibly the difficulties in skiagraphy of the vertical fractures of the head, the writer has prepared two skiagraphs of an experimental fracture of this type (see Fig 1 a and b). They will serve to call attention to the necessity for care in the interpretation of a doubtful skiagraph. The specimen represents a complete fracture separating the anterior third of the head, with the forearm in nearly full pronation, *i e*, in the position taken by it in the usual fall on the hand, which accident is probably responsible for most of the cases. For one skiagraph the forearm bones were placed



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ly m p

FIG 1 B



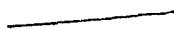
Vertical fracture of the head of the radius experimental—lateral view Forearm in pronation



FIG 3



line of fracture



Vertical fracture of head of radius without injury of upper epiphysis Lateral view

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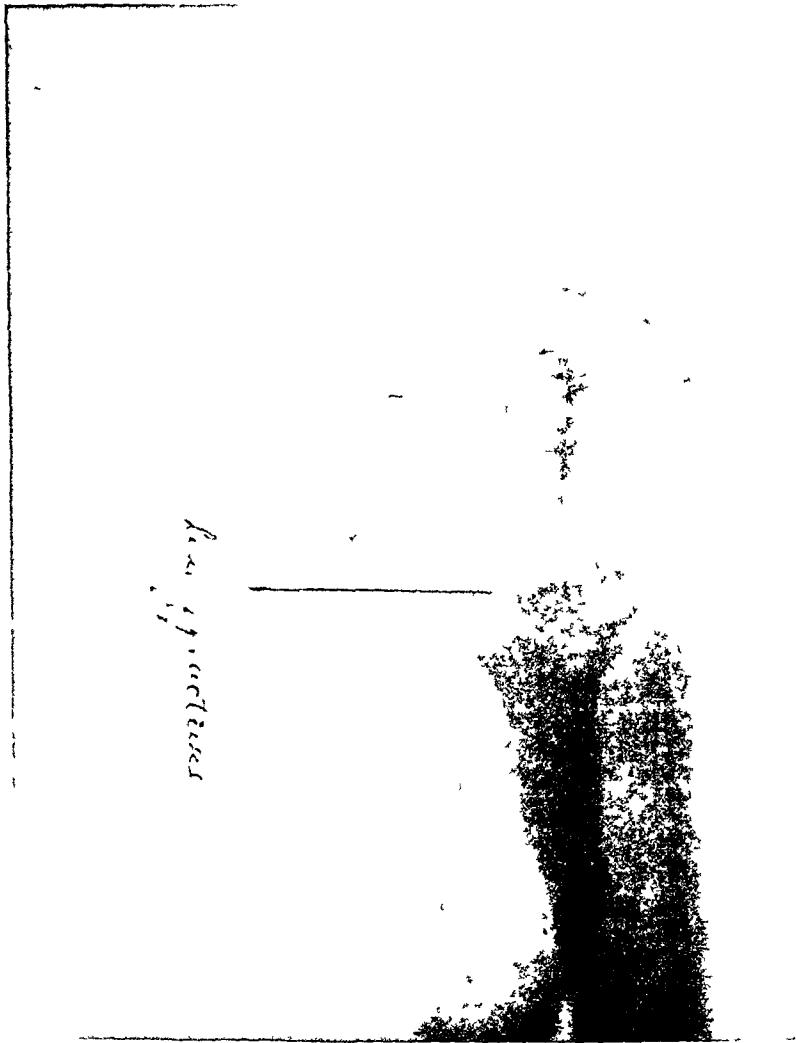


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FIG 5

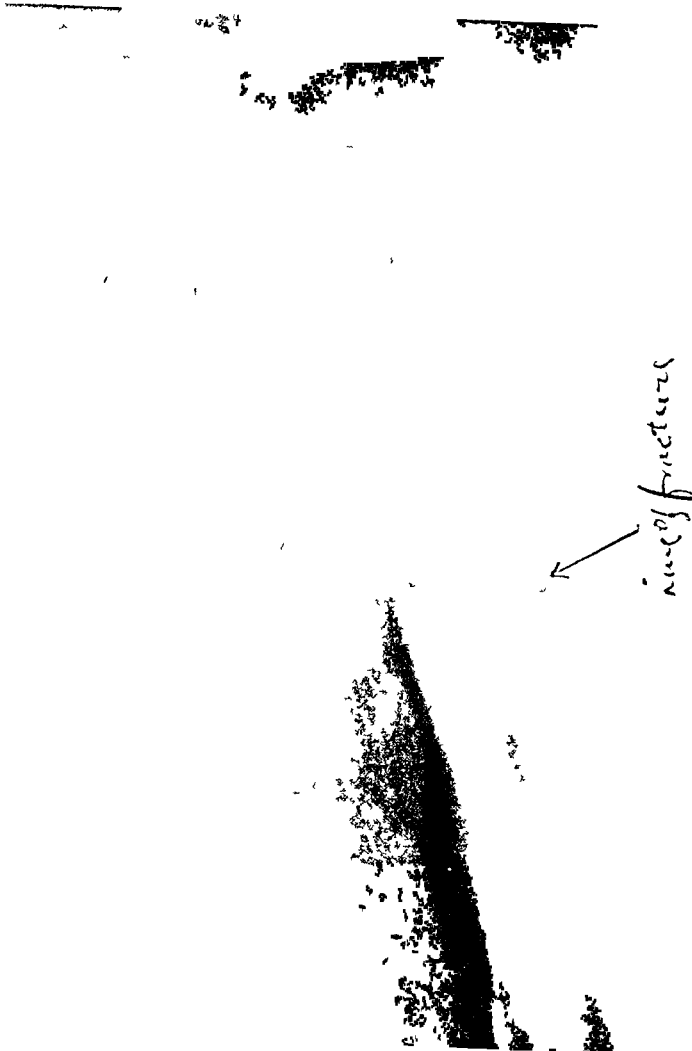


Vertical or oblique fracture of radial head Lateral view

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FIG 7



Uncomplicated vertical fracture of radial head in adult Non union

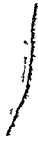
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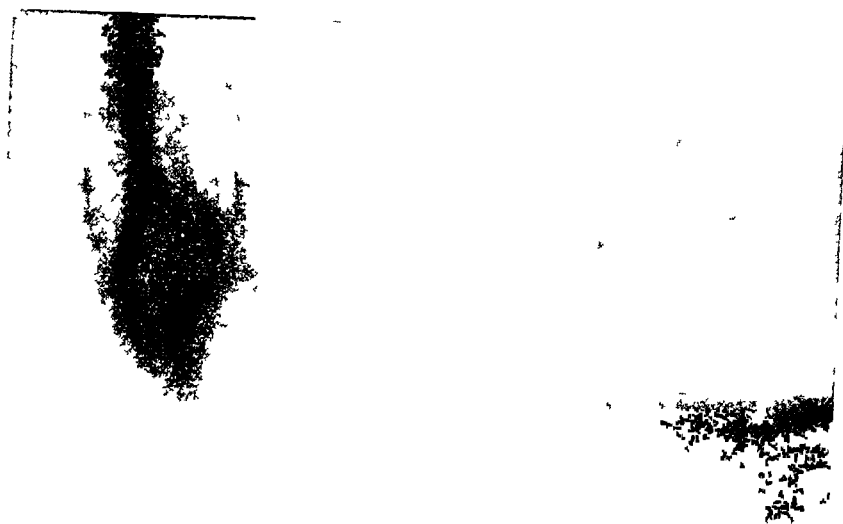
FIG 9



Fracture of neck of radius with typical deformity

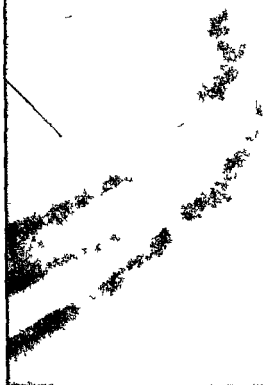


FIG. 11



Fracture of head with anterior luxation of the radius Lateral view

Delta heel fragm f b d



Picture f b d w h pos 1 b d the





in the position of nearly full pronation the detached fragment being then anterior and the line of fracture passing transversely. A lateral view was then taken that is the rays were made to pass as nearly as possible in the line of fracture this line being slightly angular. For the other skiagraph the bones were so placed that the line of fracture passed as nearly as possible in an antero-posterior plane; *i.e.* the bones were placed in a position about midway between full supination and the mid-prone position. An antero-posterior view was then taken. If the forearm were in full supination the detached fragment would have occupied a postero-external position and the line of fracture would have passed obliquely from about the external surface of the head to the posterior surface and would therefore have been in an unfavorable position for an antero-posterior or a lateral view.

In comparing these two skiagraphs with those occurring *in the living* it should be borne in mind that all the soft tissues were removed from the specimen the bones being cleaned by scraping and the ligaments by close dissection. The elbow joint had been opened freely which explains the abnormal relations of the bones but the orbicular ligament was in place and the fragments closely approximated as they frequently are in life. In the living there will probably always be some slight movement of the limb because of the flash and noise of the X-ray machine so that the absence of movements in the specimen added to the clearness of these two skiagraphs. Moreover the obscurities from over and under exposure have been well avoided. It is evident therefore that we have here two skiagraphs of this obscure fracture made under the best possible circumstances. How much more obscure would such a fracture have been in the living with all the tissues now swollen in place the slight movements during the exposure to the X-ray and the practical impossibility of knowing the exact direction of the line of fracture.

If the rays are directed at right angles to the line of fracture the skiagraph will probably be negative in most cases. Is it possible to determine the direction of the line of fracture

so that we may pass the rays directly through the line of fracture or nearly so? If the fracture is due to a fall forward on the hand, and most of them probably are, then we know that at the moment of impact the fragment is anterior, and that the forearm is in pronation, since in all positions of the forearm with the elbow in extension, only the anterior part of the radial head is in contact with the external condyle, and in a fall forward on the hand the forearm is in pronation. With the forearm in this position, therefore in a lateral exposure the rays should pass directly or almost directly in the line of fracture. In the writer's opinion this is the best view to obtain, in most cases. Because the direction of the rays will vary more or less in each case, sometimes the fracture shows above the coronoid process, sometimes below, or both, sometimes through it, and at other times in front of it. Another advantage in favor of this position is the fact that owing to the disturbance within the joint, the pain is so great that for some days at least no other position will be permitted by the patient.

If the forearm could be so placed that the detached fragment was exactly external, an antero-posterior exposure to the X-ray would give a skiagraph of the line of fracture not obscured by the coronoid process. One of the great difficulties, however, is in judging accurately the position of the forearm, when an attempt is made to supinate it. It should be borne in mind that the shoulder is responsible for a considerable degree of rotation and to what extent the shoulder and elbow are contributing in a particular case has not been easy to decide. The writer has seen only one case in which a satisfactory result was obtained with an external fragment, and that was in his first case, which was quite the result of chance, as nothing was then known of the mechanism of the fracture by the writer or the skiagrapher. On the other hand, he has repeatedly obtained a satisfactory exposure by a lateral view with the forearm in pronation.

Unfortunately all falls on the hand are not forward, and the hand is not always in pronation at the moment of impact. As it is always the anterior part of the head which will receive

the brunt of the force from the external condyle whatever the degree of rotation it is evident that a different portion of the head will be involved at the moment of impact with each change in the degree of rotation It is a fact therefore of the greatest importance that most falls are forward when the hand is usually in pronation since from that fact we know the positions of the fragment and the line of fracture

In some cases it was observed that in the first week following the accident after the acute symptoms had subsided a considerable degree of rotation was possible This is due to the close approximation of the fragments and their inability to move on each other the head moving as a whole within the orbicular ligament The more perfect the approximation the more quickly will rotation be permitted It is probable however that only in very rare cases will complete supination be possible until some weeks after the fragments have united In this type the vertical fracture of the head rotation is most disturbed at the time of the accident and for some weeks later but it is more rapidly restored than is flexion and extension While the acute symptoms at the time of fracture are distinctive of this injury it is this persistent limitation of flexion and extension and less markedly of pronation and supination for some weeks following union that is most characteristic in the absence of crepitus or a skiagraph showing a line of fracture When there is wide separation of the fragments or the neck is broken the skiagraph will have little difficulty in disclosing the fracture Much care will be necessary in the taking and the interpretation of the skiagraph in the ordinary vertical fracture of the head and due attention must be given to the symptoms if overlooking this frequent and important fracture is to be avoided

The following case occurring in the practice of Dr H A Smith of Philadelphia illustrates a condition in which the skiagraph will be of no avail however carefully and skilfully it is taken

A boy 6 years old fell from a height of three steps on his left side without knowing what part of his body struck the

ground When he was brought into the house his mother says that the affected arm hung helpless at his side and that the pain was very severe He could not then move the elbow When Dr Smith saw him some hours later, there was considerable swelling on the outer side of the elbow Palpation of the condyles of the humerus, the whole of the ulna and the shaft of the radius, did not reveal a point of tenderness or pain But directly over the head of the radius the pain and tenderness were very severe, both on direct pressure and any attempt to move the forearm Dr Smith made the diagnosis of fracture of the head of the radius At the doctor's request the writer examined the patient and reached the same conclusion Since ossification in the radial head does not begin until the fifth year, the skiagraph did not promise help in establishing this diagnosis Two skiagraphs, however were tried, one giving a lateral and the other an antero-posterior view No shadow of the head was obtained in either In such a case, if the diagnosis is to be made, it must depend on the symptoms, and in this case they were typical at this stage Twenty-four days later the writer examined the patient for the characteristic limitation and found it distinct and typical The early marked limitation of rotation had disappeared almost entirely, but the flexion and extension, as is also usual, were more distinctly limited, both to about ten degrees of the normal There was now no pain on movement, and the patient could lift an ordinary kitchen chair with both hands, the affected arm apparently doing as much work as the right Every sign of fracture of the head, therefore, peculiar to those cases in which the skiagraph had shown positive fracture, was present in this case, and in the writer's opinion pointed to a positive fracture of the cartilaginous head

A case, somewhat similar to the preceding, occurred in the practice of Dr W Drummond of Philadelphia, in a man about middle life It was the writer's privilege to examine this case also There was a distinct history of a heavy fall on the hand from a wagon Every symptom pointed to a severe injury of the radial head and of no other bone, while the later history showed the typical limitation of movement for some weeks after union The skiagraph showed only the slightest sign of fracture on the under surface of the head, although this was distinct If the skiagraph were absolutely negative the writer would still make a positive diagnosis of fracture of the head as in the previous case

In most cases of this type union occurs in about 4 weeks and the limitation of movement rapidly disappears in a few weeks following the removal of the dressings. This was so in cases seen by Drs A C Wood W Drummond H A Smith E Y Rich of Philadelphia and A B Donaldson of Bala Pa. In two cases already reported by the writer union occurred in the usual time in one while in the other during rough manipulations by the masseur a refracture occurred showing that the union was probably fibrous. In both the return of function was equally rapid and complete although in the latter slight crepitus shows that non union is still present.

The writer succeeded in following up two of Dr Pancoast's cases. In connection with one the mother of the boy said that the patient failed to return for dressings after the first visit. The original dressing was kept in place for a week or two and was then taken off the mother thinking the injury trivial. Full function returned. In the other case the fracture occurred about 10 months ago. When the writer found him recently the patient had become very much discouraged and he was contemplating giving up his usual occupation to take up lighter work. There is a constant annoying pain in the elbow and when using the limb vigorously at his work the pain is transferred down the forearm (probably from pressure on the posterior interosseus nerve which winds closely around the head and neck of the radius). Occasionally there is pain in the wrist and at rare intervals the pain in the elbow is very severe. Extension could be carried only to about 30 or 35 degrees of the normal. Limitation of rotation was slight and almost unappreciable. It is worthy of note that at the time of the fracture 10 months ago slight but distinct crepitus was elicited showing that there was some movement between the fragments. The skiagraph now shows an ununited fracture.

If these fractures of the upper end of the radius have been common then it would be interesting to know how many or what percentage leave permanent disturbances as in the preceding case. Again the question naturally arises as to whether an injury so obscure at the time of its occurrence will give signs long afterward sufficient to warrant a diagnosis of fracture of the head or neck of the radius. The writer has a

skiagraph of a fracture of the neck of the radius, taken about 15 months after the accident, when no external signs were present pointing to the original injury, except a slight limitation of rotation. Yet that skiagraph permits no doubt as to the nature of the original injury. What signs should an old fracture of the head or neck present? Since writing his first paper on this subject, the writer has been anxious to find cases of this kind.

The first to arouse his suspicion was in an old acquaintance. He had no pain, but as long as he could remember he had been unable to rotate his forearm. On examination it was found that flexion and extension were free and full, but there was complete inability to rotate the forearm, indicating a probable bony union between the radius and ulna, in some part. The palm of the hand was always turned downward, *i e*, the forearm was fixed in the position of pronation, the position in which fractures of the head and neck usually occur. No deformity could be detected in either the radius or ulna, such as would tend to show the seat of an old fracture. He had never had any bone or joint disease. He had heard his parents, now dead, say that he had sustained a severe fall in early childhood, which produced a severe injury of the arm, but its nature had never been understood. He called the writer's attention to a peculiar movement at the wrist. Although he could not supinate the forearm in the least, he could by strong effort turn the hand in the direction of extreme pronation so that the palm looked upward. He further called attention to a peculiar deficiency in the lower end of the ulna, which the writer could not explain, but was inclined to consider as a gradual disappearance of bony obstruction to the repeated efforts that he had probably made, during many years, to turn the hand in the direction of extreme pronation, in his attempts to compensate for the loss of supination in the forearm.

It is evident that such complete ankylosis of rotation as exists in this case, following a severe injury, with no history or evidence of bone or joint disease, must have been caused by a fracture. A fracture at the lower end of the radius or ulna or both, which would leave such a result, would almost cer-

tainly have been recognized at the time of the accident or later. A fracture of the shafts of the forearm bones to produce so much disturbance of rotation would probably have resulted in union of both bones across the interosseous space and that could hardly have escaped detection. A fracture of the condyles of the humerus or of the olecranon would probably have been recognized at the time and if ankylosis followed flexion and extension would have been most markedly disturbed whereas in this case they are not at all disturbed. In the writer's opinion only a fracture of the head or neck of the radius or both would have so limited rotation alone and at the same time have been so obscure as to escape the attention of the physician. Owing to the fact that the patient lives in a distant city the writer has so far failed to obtain a skiagraph of this patient's elbow. The fact that the forearm is fixed in pronation is significant since we know that most of these fractures result from a fall on the hand with the forearm in pronation. It is probable that the head or neck of the radius or both were severely injured and that immediately following the accident he could not rotate the forearm because of the pain and later because of the change in the shape of the head of the radius or its union with the ulna.

While the writer was treating a patient for a sprain of the knee his attention was called to an obscure injury of the elbow which the patient had received about twenty five years before and which had left him with limitation of rotation ever since. The diagnosis had never been made. He had fallen from a horse on his hands and had injured his elbow severely. He experiences very little trouble now but notices that during boxing exercises in which he indulges frequently for pastime there is one blow he avoids because his thumb is in the way and is unduly punished. On examination the writer found that pronation was complete but that supination was not quite complete and that it was owing to this incomplete supination that his thumb suffered during boxing. Flexion and extension showed nothing abnormal. Suspecting an old fracture of the head of the radius a skiagraph was taken and that part of the head broken off in the usual fracture showed in the opinion of the writer slight evidence of an old



fracture which had united leaving too little evidence of deformity to be positively recognized by the skiagraph

In a third case the skiagraph was more positive. A medical student informed the writer that at his boarding house was an old man, who had asked to have his forearm examined. The student could not make a diagnosis, and after stating the circumstances of the case, asked the writer for a suggestion as to the cause of the trouble. Suspecting a fracture of the head or neck of the radius, the patient was brought to the University Hospital, when Dr Pancoast took two skiagraphs of the elbow, one a lateral view with the forearm in pronation and the other an antero-posterior view with the forearm about midway between full supination and the mid-prone position. The latter was the more satisfactory, and a corresponding view of the opposite elbow was taken, for comparison. (See Fig 13—a and b)

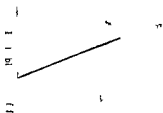
The patient is a man, 64 years of age. About 50 years ago he injured his forearm, he thinks by a wrench while at play with another boy. Although his memory is very vague as to the exact circumstances, he thinks that it was while his arm was still in a sling that he fell a considerable height from a beam in a partly constructed new building. This fall could easily have produced a fracture of the head or neck of the radius. All that he is certain of now is that he has not been able since to properly rotate his forearm. Flexion and extension are free and complete. The condition has considerably disabled him as a carpenter. He has never known the nature of the injury, the diagnosis never having been made. The skiagraph shows clearly, in the writer's opinion, that the radial head has been fractured, and that the deformity shown is sufficient to account for the limitation of rotation.

In fractures of the neck, which, unlike those involving the head, are transverse or nearly so, impaction is relatively common. That part of the head which is detached in fractures of the head, only, is driven downward and forward by the impact of the humerus, so that the head forms an angle with the shaft. Pratt,<sup>5</sup> who wrote at some length on this subject, did not say anything of impaction, but observed that there was a displacement of the upper fragment, which it was difficult or impossible to reduce. He advised excision of the head in these

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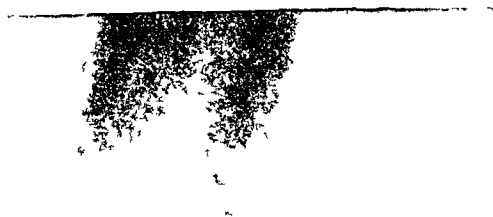
<sup>5</sup> Revue d'Orthopedic, March, 1906

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(111 cl re )

FIG 13 B



Normal elbow, the uninjured side for comparison, with Fig 11 A

cases He observed also that crepitus was sometimes absent and accounted for it by assuming that owing to the pull of the biceps muscle on the lower fragment the fragments were not in contact with each other From the histories of two cases and from the skiagraphs of these two and a third case the writer is inclined to believe that impaction is frequent in uncomplicated fractures of the neck Three of the four cases in this group seem to show it The impaction would account for the difficulty in reducing the displacement and for the absence of crepitus which Pratt observed We know that impaction is common in fractures of the lower end of this bone The same cause a fall on the hand will explain its presence in both fractures While theoretically the biceps might pull the fractured surfaces of the lower fragment out of contact with that of the upper as Pratt says the writer cannot find any evidence of it in any of these skiagraphs The writer has already referred to a specimen of this fracture in the Mutter Museum of Philadelphia showing the typical deformity which Mutter accounted for by the pull of the biceps The deformity in that specimen corresponds in a marked degree with the deformity shown in all three of the probably impacted fractures of the neck in this group Much attention was given to this by the writer in his first paper The angulation in the neck is probably due to the downward impact of the external condyle against the anterior part of the head of the radius which is driven downward and forward producing the angle in the neck Even if the pull of the biceps was responsible for the deformity in the museum specimen as Mutter says it was not instrumental in separating the fractured surfaces from each other Pratt also says that usually the greatest prominence of the upper fragment was posterior and external This statement has very little meaning since it does not give the position of the forearm When the fracture is due to a fall on the hand in the prone condition the greatest prominence of the head will be anterior in pronation and by partial supination will be placed in an external position If full supination could be produced it would occupy a postero external position

# ISOLATED FRACTURE OF THE GREAT TROCHANTER

BY GEO E ARMSTRONG, M D,

OF MONTREAL,

Surgeon to the Montreal General Hospital

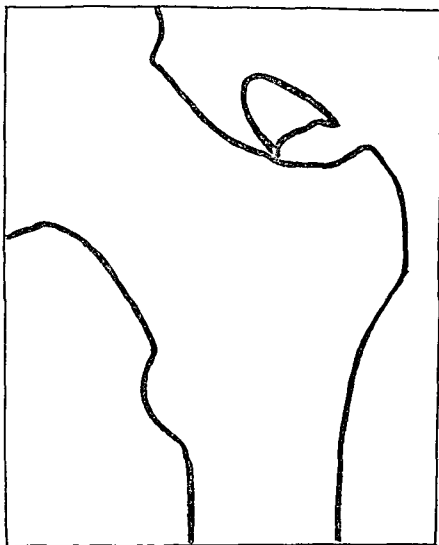
J M, AGED thirty-three years, was admitted to the Montreal General Hospital November 3, 1906, complaining of pain in the right thigh and inability to move the right leg. Physically, he was an unusually well-developed muscular fellow. While performing his duties as shipper in a large milling company, he was struck on the right thigh just behind the trochanter major by a falling bag of flour, weighing 140 pounds. He was alone at the time, but succeeded in walking on the left leg with the support of a flour-carrier to the stair, where he got help. On examining him a marked swelling was observed in the region of the right trochanter. Light pressure caused pain and there was considerable surrounding ecchymosis. There was no shortening of the leg. He could move his leg a little in all directions. No crepitus could be made out. There was no outward rotation or any relaxation of the tensor vaginæ femoris fascia. The X-rays showed a separation of the great trochanter from the femur at the outer part, the inner part apparently remaining attached by periosteum and fibrous tissue. The leg, slightly flexed at the hip and knee, was strongly abducted, and together with the pelvis immobilized in a plaster-of-Paris spica bandage. The limb was neither rotated outward nor inward, the toes pointing in a normal direction.

He left the hospital January 18, 1907. On March 20 he returned for examination, walking perfectly well, no limping was discernible. Another X-ray photograph was taken which seemed to show bony union between the apophysis and shaft.

This fracture is one of unusual rarity. Morris was able to collect only 6 undoubted cases. Stimson<sup>1</sup> refers to 7 museum specimens, 2 of which were obtained in the dissecting room without history. Ewart<sup>2</sup> reports a spontaneous fracture through the great trochanter of the left femur in a female

sixty five years of age a subject of mollities osseum While walking with a stick and leaning on her daughter s arm they both heard a crack and the patient subsided to the ground

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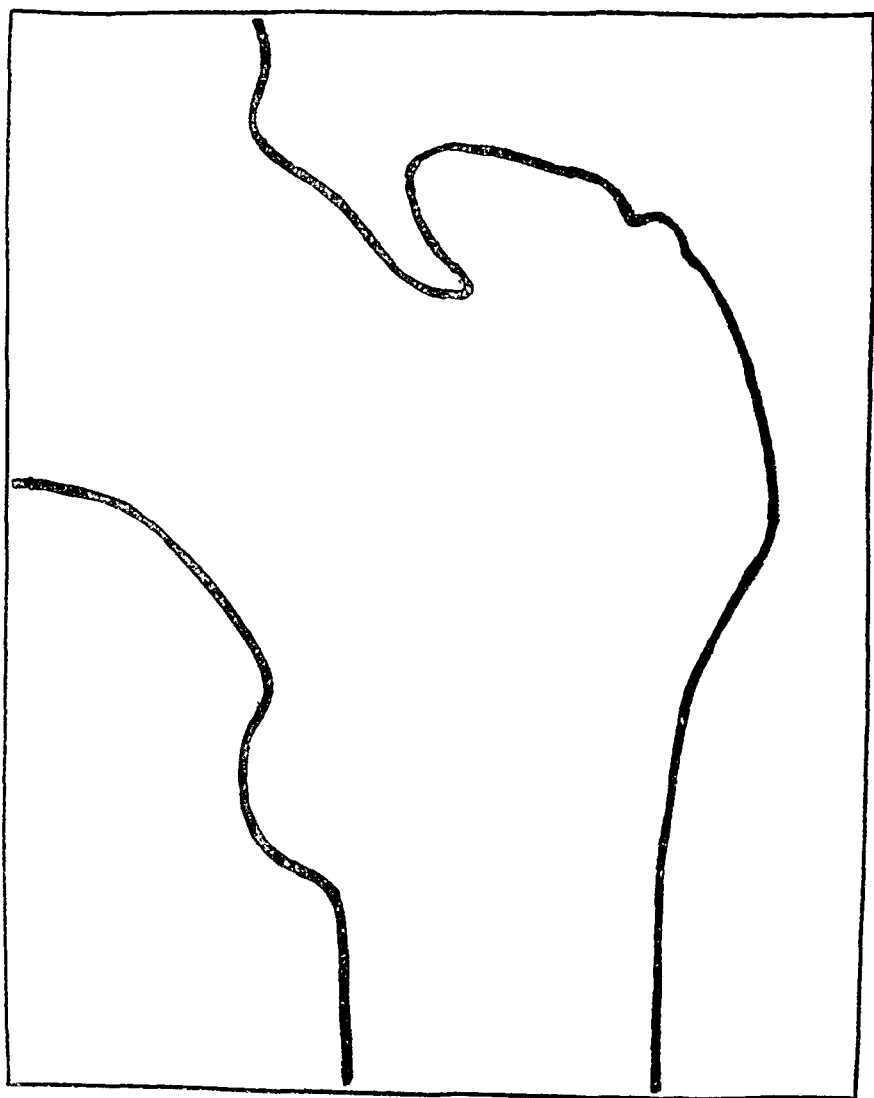


Tra g f X ray t k h rtly ft dm t h p t l

A diagnosis of extracapsular fracture of the femur was made A skiagram taken three weel s later showed the fracture to be through the great trochanter Another skiagram taken at the

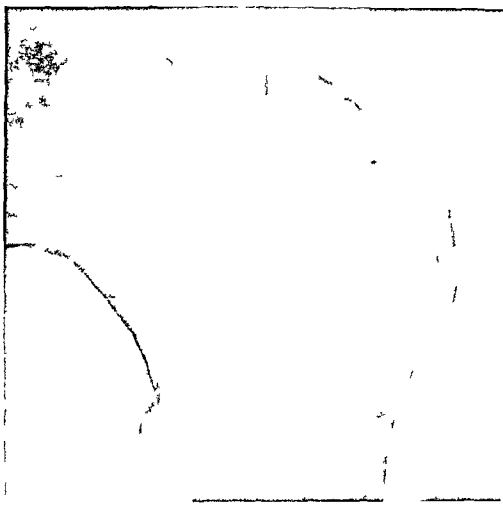
ninth week showed the fracture had united with osseous union, a large amount of osseous callus being present Eleven weeks after the accident the patient was able to go out in a chair and suffered no pain

FIG 2



Tracing of X ray taken four and one half months after the accident

As there was one inch shortening in this case, it may be objected that the fracture here extended through the neck and



\\ y t k h tly fl dm t th hosp tal





so was not an example of isolated fracture of the great trochanter

The fracture has generally been the result of direct violence applied outside and behind the trochanter or from a fall upon the hip

Neck<sup>s</sup> reports an instance of fracture of the trochanter major from muscular contraction. It occurred in a laborer twenty four years of age who while engaged with another man in lifting a heavy sack twisted his body and felt a severe pain in the region of the left hip. The injury did not compel him to stop work immediately but the pain continued was increased by movement and sometimes a creaking noise was felt. Seven weeks after the injury there was felt on the outer side in the neighborhood of the trochanter major a disc shaped piece of bone the size of a two mark piece. During rest in bed a strong callus was thrown out and fourteen days later through an incision made with a view to suture the piece was found to be no longer moveable. In this case it seems probable that while the leg was fixed in a position of inner rotation the forcible twisting to the left of the body while lifting the heavy sack caused a piece of the great trochanter to be torn off.

The amount of displacement of the fragment varies and depends upon whether the epiphysis together with the periosteum and fibrous tissues have been completely torn away from the diaphysis or not. When there is no marked displacement of the fragment (the patient is a stout well muscled individual) and a good deal of swelling is present at the time the condition may very readily be mistaken for a severe contusion. When the fragment is completely torn away from the femur it may be drawn upward and backward as much as 6 cm. from its normal position. There may then be apparent a depression in the normal situation of the trochanter not present in the opposite side. Crepitus may sometimes be obtained by pushing the fragment downwards while the leg is well abducted and rotated outwards.

The prognosis would seem to depend partly upon the degree of detachment of the fragment. If completely separ

ated it is altogether likely that union occurs by pseudoarthrosis. When the periosteum and fibrous tissues are only partly separated bony union may take place. The separation generally follows the epiphyseal line.

In regard to treatment it would appear that when the fragment remains partly attached to the shaft a perfect functional result may be obtained by rest in bed and immobilization of the limb in an abducted position. I have seen no reports of the functional result in cases where the fragment has been completely detached and elevated several cm from its normal position, and in which union has occurred by means of a false joint. Modern technique, however, renders it safe to replace and retain the fragment by sutures passed through it or through its tendinous attachments or by holding it in place with a peg.

Bennett reports a specimen of fracture of the trochanter minor in the museum of Trinity College, Dublin, associated with intracapsular fracture of the neck.

Traumatic separation of the epiphysis of the trochanter major under the age of eighteen has occurred more frequently than has fracture in adults. Poland<sup>4</sup> was able to collect 12 cases of separation of the epiphysis of the great trochanter. Thienhaus<sup>5</sup> reports an instance in a little girl eleven years of age who was violently thrown down on the floor by her schoolmate who pushed her unexpectedly from behind. During her fall she struck heavily upon her left hip. Although suffering pain she was able to limp home, a distance of one mile. The following morning she was unable to rise from her bed. A diagnosis of contusion was made by her physician. Thienhaus was unable to reach a definite diagnosis without a skiagram, which showed an incomplete separation of the epiphysis of the great trochanter. In 5 cases death followed within a few weeks after the violence which was thought to have caused the separation, and was preceded by fever and suppuration along the upper part of the bone.

The only definite means of positive diagnosis is a Röntgen-ray picture. It is quite possible that the lesion occurs more

frequently than thought and is treated under the diagnosis of contusion

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## POST-OPERATIVE TREATMENT \*

BY JOHN H GIBBON, M D ,

OF PHILADELPHIA,

Professor of Surgery, Jefferson Medical College, Surgeon, Pennsylvania Hospital

PROBABLY no part of surgical work offers a better opportunity for the display of individuality than the post-operative treatment of our patients. Many of us attribute our good results as much to our particular after-care as to our individual operative technique. There can be no question regarding the importance of this subject, and after many operations and in certain conditions its importance becomes prime.

The welfare of a patient after an operation depends not only on the skill and accuracy with which the operation is done, but also on the means employed during the operation to conserve his strength, maintain the normal resisting power of his tissues, and render his early hours after operation peaceful and free from pain. The operator who works regardless of time and the amount of anæsthetic his patient is taking, or who pays no attention to the patient's posture on the table, the protection of the body not involved in the field of operation, or who uses large quantities of fluid regardless of whether it drains away properly or accumulates under his patient, is laying up for himself many post-operative complications which he who employs "speed without haste" and is thoughtful not only of the operation itself but his patient's condition, will seldom see. I do not advocate a want of thoroughness in operating in order to accomplish the closure of the wound in a certain number of minutes, or the constant shifting of the mind from the operation itself to the patient's condition, but I do mean that we should not drag an operation along over an unnecessarily long period, and that we should establish in our operating rooms a habit among our assistants and nurses of

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\* Read before the Philadelphia Academy of Surgery April 1, 1907

carefully looking after the comfort and condition of the patient. The post operative treatment really begins when the patient is still on the table. This is prophylaxis the best of all treatments. We sometimes see patients anæsthetized long before the operator and his assistants are ready to begin their work. Again we see patients put on the table with an unnecessary exposure of the body with scant covering for the portion that is covered and the whole or a large portion of the trunk if it is an operation on the upper abdomen deluged with water which quickly loses its temperature and chills the patient. Not infrequently we see patients placed on the operating table with nothing between the body and the glass or metal table but a thin wet sheet and more frequently still with the arm hanging over the edge of the table in such a way that the musculo spiral nerve is pressed upon sufficiently to produce a palsy. These are only some of the thoughtless things of which we are occasionally guilty and which go later to spell disappointment and sometimes disaster. Who has not seen a troublesome wrist drop which long outlasts the convalescence from a simple operation or a pneumonia from exposure and cold on the operating table or during transit to the ward or room without appreciating the importance of the thought of the post operative period before and during the operation? We should never become so wrapped up in our operation and in demonstrating its steps to onlookers as to forget our patient's condition.

The choice of an anæsthetic to suit the individual case is a matter of great importance from a post operative point of view as many of our complications in this period have their origin in the anæsthetic such as pneumonia suppression of urine vomiting etc. It is a great mistake to confine ourselves exclusively to one anæsthetic. Many a feeble patient who could not stand ether or chloroform anæsthesia can be operated upon with impunity under infiltration anæsthesia or with the morphia chloride of ethyl and ether or the morphia scopolamin chloride of ethyl and ether sequence. I have been able with the latter sequence to remove a large ovarian cyst from a very old lady to whom I should have hesitated to

give the required amount of ether alone. In this case one hypodermic of morphia,  $\frac{1}{6}$  gr, and scopolamin,  $\frac{1}{100}$  gr, was given 2 minutes before operation. She was rendered unconscious with chloride of ethyl in about a minute, but one-half ounce of ether was employed during the entire operation, and the patient slept for an hour or more after it. In another case I was able by intraneural injection of cocaine to amputate the leg without shock in a tuberculous patient to whom I feared to give ether lest his lung condition should be rendered active. In many cases of empyema chloride of ethyl will suffice for a rapidly performed thoracotomy. The same applies to the drainage of other collections of pus, and to amputations where time is an element and ether is contraindicated. It is well to familiarize ourselves with the different anæsthetics in order that we may be able to choose the best for the individual case.

Another factor in operative technique which has a marked post-operative influence is the way we handle the tissues and close the wound. A potent element in producing pain and predisposing to suppuration is the ligation of large masses of tissue and the tight suturing of wounds. There is no doubt that a comparatively clean wound, such as a lacerated wound of the scalp, which would otherwise heal by first intention, can be made to suppurate simply by tight sutures. All that Nature requires is a gentle approximation of wound edges, and more than this is detrimental. The present custom of closing wounds in layers has done much to reduce suppuration and to increase the patient's comfort.

Among the chief complaints after operation are pain, nausea, and thirst. The pain of course varies greatly according to the site of operation, and the individual disposition. Probably abdominal operations produce more pain than others, but this may be only because of the aggravation of the discomfort caused by the movement of the diaphragm, especially such excessive actions of this muscle as take place in retching and coughing. One of the surprising things about post-operative pain is that it is not more marked in certain plastic operations such as hernia, repair of the perineum, etc. In all

of these however it can be made very severe by too tight constriction of wound edges. Too much attention cannot be given by the surgeon to the prevention of pain at the critical period when quiet and sleep do so much to aid a prompt convalescence. There was a time not long since when it was the rule of most surgeons to withhold pain relieving drugs such as morphia after abdominal operations. To give a hypodermic of morphia in these cases was thought to be a great mistake but now we have learned that when properly employed in the post operative treatment it is a great boon both to the patient and to the surgeon. All the bad effects formerly attributed to this drug such as the production of flatus bad effect on the kidneys etc we seem now to have forgotten or at least we have learned that it was our own faulty technique which produced much of the trouble attributed to the morphia. It was usually infection and not morphia that caused the trouble. I am glad to say that I have never done an abdominal operation without administering a hypodermic of morphia and atropia before the patient has recovered consciousness and I have never observed in any single case a bad effect and my results generally have not been so bad as to make me change *this plan of preventing to some extent at least the post operative discomfort of the patient*. When I was a hospital interne and assistant it was the custom of most of the operators after a laparotomy to order morphia probably a small dose to be given only if absolutely necessary. My experience was that it usually became necessary and then the patient having learned the relief to be obtained by its use begged for a repetition of the dose. My present custom is to give a single hypodermic of morphia  $\frac{1}{4}$  gr and atropia  $\frac{1}{150}$  gr before anaesthesia is started or certainly before the patient regains consciousness. The result is that the patient passes from the sleep of the anaesthetic to the morphia sleep gets comfortably over the most distressing hours after operation those first few when ether is being eliminated by the lungs in large quantities and nausea and vomiting are common and never knows that morphia has been given. The idea that morphia causes vomit



ing after an operation is absurd. Formerly I only used this plan in abdominal cases, but the vomiting was so much less than in the other cases where it was not employed, and the patient's comfort so much greater and his return to consciousness so much quieter, that I now give the hypodermic after any operation of magnitude or long duration, or where I expect much after-pain. It is seldom that I am obliged to give a second dose, and this I try particularly to avoid, for I think it is better not to let the patient learn the comfort of morphia. It is largely for this reason that the drug is given before the close of the operation, and this time is also chosen because I want the drug to act before the patient begins to regain consciousness and vomit. A large majority of patients after this treatment never vomit at all. All one has to do to become convinced of the advantages of this method of treating post-operative pain is to employ it in a few cases and compare the results with those obtained when no morphia is used, or when it is given late and in small quantities. The repeated small dose of morphia does not appeal to me, because it would seem that the patient would become dependent upon it. Where the single full dose is given before the close of anæsthesia the patient if not disturbed will often sleep for from one to three hours, and remain quiet for a much longer period.

Pain developing some hours after an operation is not to be treated by the administration of an anodyne, but its cause should be carefully sought and removed. A careful and considerate nurse can do much to relieve such pain. Oftentimes the simple change of posture, the cutting of a tight bandage, the relief of pressure on some bony prominence, straightening out the clothing, and such little attentions will give relief. I have seen a patient kept awake all night by pressure on the heel after fracture of the leg, and by pressure on the internal condyle by an internal angular splint. Pain under such circumstances is absolutely unnecessary, and its possible cause should always be considered. I have known a safety pin to be passed through the patient's skin in fixing a bandage and to remain in this position for days. Therefore, instead of putting

down the patient's complaint of pain to nervousness or to want of pluck we should always make sure that there is not some actual cause for the complaint

Nausea and vomiting are not nearly so troublesome after operations as they once were. This has largely been due to the improved methods of administering our anesthetics and it can be largely obviated by making the quantity of anæsthetic employed as small as possible. The amount of ether and chloroform administered has much to do with the continued vomiting after operation and it can easily be reduced by the judicious use of morphia and atropia administered either before or during the anæsthesia or by administering chloride of ethyl or nitrous oxide before the ether or chloroform. It is my invariable custom to employ chloride of ethyl first and in this way the amount of ether is reduced nearly one half. The less ether there is for the patient to eliminate the less nausea and discomfort he will have and the less likelihood of interference with the eliminating function of the kidneys. As I have indicated before the use of morphia at the close of the operation before the patient regains consciousness will entirely obviate or greatly reduce vomiting. Inhalations of vinegar have long been employed to reduce nausea and do seem to be productive of some good. So simple a means as elevation of the head will often reduce the sensation of nausea and a draught of water will sometimes not only not increase the nausea but will reduce it. Where it is possible for the patient to be placed in the sitting position nausea will frequently be relieved. This is particularly true *after operations on the stomach itself*. A drainage tube placed in the abdominal cavity may produce continued reflex vomiting which will cease on removal of the tube. In my own experience troublesome vomiting is rare where a full dose of morphia is given at the close of the operation.

Thirst too is a symptom which is much less troublesome now than formerly where water was withheld for long periods after operation. The thirst can be largely relieved by giving large quantities of salt solution by the rectum. There are few operations however after which water cannot be given

promptly by the mouth. If a patient is not nauseated I allow him water within a few hours in quantities of an ounce. It has not been my experience that this is apt to start up vomiting. This early administration of water applies after abdominal operations as after others. I think the giving of a considerable quantity of water at regular intervals is preferable to the continual sucking of ice. Liquid food should be given as soon as the patient has a desire for it, or as soon as the nausea has passed away.

Confinement in one position, with the restriction of all movement after an operation, is extremely trying on a patient, and often results in insomnia and nervousness. Any movement that does not directly interfere with the healing process of the wound should be allowed. It does not hurt a properly closed abdominal wound if the patient is early placed upon his side, or if the shoulders are elevated, or the legs drawn up. When a patient is very anxious to change his position and you are sure this change will not be comfortable, it is not a bad plan to allow him to try the new position, when he will be convinced of his own error and more contented in the position he had first occupied. Too much care cannot be given to obtaining a comfortable attitude in bed after an operation. Restraint in an unnatural position gives rise to the greatest restlessness and discomfort. This is well illustrated in the tight confinement of the arm to the chest after breast operations. The patient is much more comfortable, the wound heals better, and there is less restriction of subsequent motion of the shoulder, if the arm is dressed at a right angle to the body.

One of the problems after abdominal operations is the best time at which to open the patient's bowels. Formerly it was the custom of most surgeons to give some laxative, usually calomel, on the day following the operation. This was due to the fact that an early movement of the bowels usually meant that no infection of the peritoneum had occurred, or that such an infection was not extending. The mere movement of the bowels, however, is in no way curative under such circumstances, and it is far better to allow the intestine to rest quietly

after an operation than it is to stir up painful peristalsis by means of laxatives. This of course applies to the cases in which a proper preparation for the operation has been made. A movement by a glycerin suppository or an oil or soapsuds enema is much more comfortable to the patient and less disturbing to the healing viscera than a purgative. If nothing but liquid food is given for two or three days after operation the third day is early enough to open the bowels.

Inability to empty the bladder is of common occurrence in the post operative period and resort to the catheter is often necessary. To resort to catheterization when the bladder is not painfully distended is a mistake and it is far better to have the patient empty the bladder himself than to pass the catheter. Some surgeons even go so far as to allow the patient to get out of bed for this purpose and where it is possible I believe it to be good treatment. I avoid the use of the catheter as much as possible. When the catheter is employed the greatest care should be exercised and the catheterization done by experienced orderly or nurse. Even under the best circumstances infections of the urethra and bladder occur and it is the surgeon's duty to see that all necessary aseptic precautions are taken to avoid these unfortunate complications. No nurse or orderly should ever be allowed to use a metal instrument. Catheterization in children is to be particularly avoided as injury of the male urethra in childhood is easily accomplished. In children I would much prefer to have the patient get out of bed to having a catheter used.

The time at which a patient is allowed to get out of bed varies with the operation which has been performed. A few rules however can easily be laid down. In the first place old people should be gotten out of bed as soon after operation as possible. The advantage of this is easily shown in the present day results from prostatectomy where the patient is gotten out of bed on the second or third day. In abdominal operations on old people a change of posture and early transference from bed to couch or chair is very important. There has been a marked tendency during recent years to shorten the period

which a patient spends in bed after an abdominal operation After simple appendectomies many surgeons allow their patients to get out of bed on the following day I have not been able to bring myself quite to this point, but I am constantly shortening the period In clean cases where the abdominal wound is accurately closed and no muscle cut across its fibres, I get the patient out of bed on about the eighth or ninth day with the abdomen well supported by a binder, and allow moving about on the tenth or eleventh day In this particular I think the individual disposition of the patient must be taken carefully into account There are many patients who are benefited by a longer rest in bed, whereas to others, such as old people, and those who are inclined to magnify their ailments, a prolonged rest may be harmful

In closing I would say that I think we are often guilty of paying too little attention to our patients during the post-operative period, and during the convalescence which follows Many good results are spoiled by this neglect For instance, take the tuberculous lesions for which the surgeon is frequently operating If the after-care of these patients is not properly carried out, especially the hygienic treatment, an early recurrence is the rule And again, after operations for syphilitic lesions we too frequently fail to instruct the patient in the necessity of continuing his specific treatment A proper restoration of function is frequently not realized because of our neglect of such agents as massage and passive movements Recurrences after operations for knock-knees and bow-legs often take place because no brace to prevent the recurrence is employed These are only a few instances which show the importance of treatment after operations

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY

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*Stated Meeting April 10 1907*

The President DR GEORGE WOOLSEY in the Chair

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### INTUSSUSCEPTION

DR J D RUSHMORE presented a boy 13 years of age who was seized about 5 A M January 8 with severe paroxysmal pains in the abdomen He was up and about during the first few hours and after that kept his bed Vomiting soon began and the vomited matter consisted at first of food (mostly custard pie a large quantity of which he had eaten the evening before) then bilious and brownish fluid without much odor bowels failed to act naturally or by enema or cathartics no gas was passed took no nourishment and slept little There was tenderness and distension of the abdomen No passage of blood or mucus from the bowel and no desire to go to stool A tumor does not seem to have been recognized until the 13th five days after the onset of the symptoms

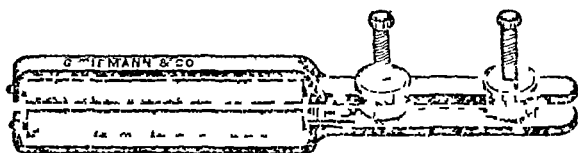
Entered hospital late in the evening of January 13 at which time his temperature was 97½ pulse 90 and of fairly good quality face pale abdomen tense some distension large tumor rather ill defined but tender on the left side following the direction of the descending colon but nearer the median line Immediate laparotomy through left rectus muscle and the delivery of a large iliac mass very dark in color well distended and twisted on its mesentery With some difficulty the intussusceptum was by traction and pressure delivered from its sheath and about an ounce of very dark and offensive fluid escaped and oiled the intestine and mesentery This fluid was sponged off with gauze

and saline solution The intussusceptum was found empty and gangrenous, but not perforated

The contents of the bowel, solid, fluid, and gaseous, were pushed back from the gangrenous area by a pair of intestinal roller-clamps made by Tiemann & Co Each clamp consists of two rollers revolving freely in their respective frames By means of four check nuts these frames can be rigidly held in any position, the two guides constantly keeping them parallel, the rollers therefore exert a uniform pressure across the intestine when it is clamped between them The surface of the rollers is slightly roughened to overcome any tendency to slide, and by a simple slide at the handle portion of the instrument they can be released from their bearings to facilitate sterilizing The total length of the instrument is about  $5\frac{1}{4}$  inches, and the line of contact of the two rollers is  $2\frac{1}{2}$  inches (Fig 1)

The healthy intestine on each side of the gangrenous portion was slipped between the rollers and the rollers were screwed

FIG 1



together sufficiently to merely bring the opposite walls of the gut into coaptation, then by steadying the gangrenous portion with a long Keith's forceps the clamp was rolled away about 5 inches and screwed down a little in order to avoid slipping The intestine between the clamp and forceps was flat and empty The gangrenous part was thus excised in the usual way, except that any deep cut into the mesentery, which was not gangrenous, was avoided, and thus secured a better vascular supply of the ends to be sutured A continuous glovers' silk suture was used to unite the cut ends, and a secondary continuous Lembert's peritoneal suture of the same material was introduced and the clamp was removed, the intestine was replaced and the abdominal wound was closed by layer sutures

The clamp worked to entire satisfaction It was easily and quickly applied, did not damage the wall of the intestine, and its use avoids the risks of a tape ligature, which necessitates a perforation of the mesentery with the possibility of injuring a vessel

and the necessity of suturing the wound after the removal of the tape. If however the clamp is screwed down too tight at first there is probably a danger of tearing the peritoneal coat of the intestine when the clamp is rolled. This accident will not occur if the clamp is properly used. It might be better to screw the clamp tight at first cut between the clamp and forceps and not do the rolling until the gangrenous mass has been removed and the sutures are to be employed. The field of operation will then be left free from more or less mucus that always escapes between the clamp or forceps or tape and the cut end of the intestine. If this method is employed a narrow strip of gut that may have been pressed on unduly by the clamp can be trimmed off giving a fresh surface for the suture. It has also been suggested that the intestine might be emptied by substituting the first or ring and middle fingers for the clamp but it is doubtful if the fingers will do the work as satisfactorily as the clamp.

After the dressings were applied the boy was put to bed with a pale and perspiring skin and a pulse of 180. Artificial heat and adrenalin solution hypodermically were employed with good effect. The temperature was 100° on the morning following the operation and gradually dropped from day to day and reached 98° on the fifth day with a slight evening rise for a few days. The pulse dropped gradually but rose again about three weeks after the operation for a few days from no apparent cause. Fæcal vomiting occurred on the first day then ceased after a thorough gastric lavage. Rectal alimentation until the third day when the rectum became irritable and the patient voided involuntarily three or four large and bloody and very fetid stools. Water to quench thirst was used from the first but not always retained. On the fourth day egg albumin was tried by the stomach and retained. After that the history is of a rapid convalescence. He left the hospital February 15 somewhat anæmic and weak and has been gaining strength and flesh since with a little sluggishness in bowel action. The length of the resected portion of the intestine was 40 inches.

#### ACUTE INTESTINAL OBSTRUCTION FROM STRANGULATION OF MECKEL'S DIVERTICULUM

Dr. GEORGE EMERSON BREWER presented a boy 8 years old who was admitted to the Roosevelt Hospital in February 1907 suffering from acute intestinal obstruction. He had always



enjoyed good health until 8 days before admission, when he experienced an acute attack of abdominal pain which was followed by nausea and vomiting. Up to the time of that attack, the bowels had moved regularly, and there was no history of previous colic or vomiting.

During the eight days which had elapsed between the onset of the trouble and his admission to the hospital he had had many periods of vomiting. During the first two or three days the bowels had moved slightly, and some gas had been expelled, but for the past three or four days before admission, absolutely nothing had passed from the bowels, and there had occurred a gradual distension of the abdomen, with slight elevation of temperature.

On admission, the boy appeared to be seriously ill. The face was drawn, the eyes sunken, the mouth and tongue dry. The abdomen was slightly distended, and on palpation, an increased sense of resistance could be apparently felt over the region of the ascending and transverse portions of the colon. The entire abdomen was moderately tender, but no distinct mass could be felt. Rectal examination was negative. There had been no mucous or bloody outflow.

The patient was immediately prepared for operation, and the abdomen opened by a median incision. The small intestine lying directly beneath the incision appeared to be of a deep purple color, and in spots was matted together by a fibrinous exudate. The cæcum and sigmoid were found to be collapsed, but a portion of the small intestine in the left upper quadrant was much distended. On drawing the congested mass upward, it was found to be tightly constricted by what at first appeared to be a thickened vermiform appendix, the tip of which was firmly adherent to a portion of the ileum, thus forming a loop through which two or three feet of ileum had protruded and had become tightly constricted. A rapid search in the ileocæcal region, however, revealed the presence of a normal appendix entirely free from the structure which formed the constricting band.

The strangulated intestines were released by dividing the constricting band from its attachment to the ileum, and the stump was ligated with chromic catgut. It was then found that the constricting band consisted of an intestinal diverticulum arising from the intestine and extending to the border of the ileum. Its distal extremity was firmly attached to the cæcum just to the outer side

of the implantation of the vermiform appendix. From this point it was divided and removed. It was found to consist of the four coats of intestine and measured about 5 cm in length. It was fusiform in shape its centre measuring about  $3\frac{1}{2}$  cm in circumference. At the point of intestinal attachment its lumen had apparently been obliterated.

After the released intestine was returned to the abdominal cavity its color gradually improved and although at the points where the constricting band had compressed the intestine there appeared to be a slight superficial necrosis it was thought that the chance of perforation was so small as not to interfere with the complete closure of the wound.

The operation was followed by comparatively little reaction and the vomiting ceased almost immediately. After a few hours there was a free passage of gas and on the second or third day a satisfactory movement of the bowels was obtained by the use of an enema.

The wound healed primarily and the stitches were removed on the sixth day. During the second week of the patient's convalescence as the result of some unusual bodily exertion the wound re-opened and a small loop of intestine protruded. This necessitated the use of anaesthesia and resuturing the wound. With the exception of a mild infection due to contamination of the wound at the time of its breaking open further recovery was uneventful.

The pathological examination of the diverticulum showed its lumen to be lined with mucous membrane similar to that lining the adjacent ileum.

In reply to a question Dr Brewer said this patient gave no history of any previous intestinal trouble.

DR CHARLES L. GIBSON said that in looking up this subject of intestinal obstruction from strangulation of Meckel's diverticulum several years ago he was struck by the fact that most of the cases that came to operation were between the ages of ten and twenty years and that it occurred mainly in the male sex. It was very much more frequent in males than in females.

DR JOHN F. ERDMANN said that six or seven years ago he reported three cases of intestinal obstruction due to Meckel's diverticulum. In one of them a gentleman rider at the Horse Show it was necessary to excise 7 feet of intestine the patient dying 2 days after the operation. The second case was a boy of 18 years

in whom the strangulation was relieved without excision, the patient making a rapid recovery. The third case was a man about 38 years old, in whom there was no strangulation of the gut, but gangrene of the tip of the diverticulum, its appearance being very similar to that of a necrotic appendix. The patient recovered.

DR WOOLSEY referred to the relative frequency of adhesions in Meckel's diverticulum, and said that a possible explanation of the fact noted by Dr Gibson, namely, that strangulation from this cause was most frequent between the ages of ten and twenty years, was to be found in these adhesions, for if they were so situated as to be a possible cause of strangulation, the latter would be liable to be produced before the twentieth year.

DR ERDMANN recalled one case in which he had assisted Dr Joseph D Bryant to operate, about 15 or 16 years ago, where a typical Meckel's diverticulum was found in a man nearly 70 years old. Gangrene and death followed.

#### INTUSSUSCEPTION

DR JOHN D RUSHMORE read a paper with the above title, for which see page 210.

DR JOHN A HARTWELL said that one reason why the true character of the lesion in these cases was so easily overlooked was the remarkable freedom from shock that these patients enjoyed during the first few hours. That fact had been pointed out by Dr Rushmore, and as an illustration of it Dr Hartwell reported the case of a 9 months old infant which he recently saw at the Lincoln Hospital. The history was that the child had suddenly begun to vomit about noon, and when he saw it, at 9 o'clock that evening, it had had one bloody movement from the bowels. The temperature and pulse were normal, there was no abdominal distension, and the child was asleep and apparently comfortable. The palpation of a tumor at the hepatic flexure caused no pain or discomfort. Upon opening the abdomen, an intussusception was found at the ileocaecal valve. It was reduced without much difficulty, and the child was discharged three days later, entirely recovered. At no time was there the slightest evidence of shock.

Dr Hartwell said that another point in Dr Rushmore's paper to which he wished to refer was in connection with the attempts

that were frequently made to reduce these intussusceptions by means other than a laparotomy. Such attempts usually left the operator in doubt as to the condition of the gut and were at times attended by an apparent relief of the symptoms without relieving the intussusception and thus valuable time was lost. In corroboration of this statement he mentioned the case of a woman who suffered from symptoms of acute obstruction 10 days after an abdominal hysterectomy.

The diagnosis of intestinal adhesions resulting in obstructive kinking was made. She was placed in the Trendelenburg position and the bowels were inflated with saline and gentle massage of the lower abdomen performed. After this she passed a large amount of flatus and was apparently much improved. Several hours later her symptoms recurred and upon opening the abdomen he found complete strangulation of the gut due to adhesions and impending gangrene. It was apparent that the efforts to relieve the obstruction by manipulating had resulted in additional damage to the gut wall. The case recovered but the patient was placed in a much more critical position than she would have been had the operation been done at once.

DR CLARENCE A. McWILLIAMS said that about three years ago he attempted to reduce an intussusception by inverting the patient and injecting the bowels with water. He had previously seen two cases successfully treated in that manner which were reported by Dr Northrop. In his own case the condition had existed about twenty-four hours. With water injection the tumor disappeared and the patient returned to bed. The symptoms however were not alleviated although no tumor was felt. The next day there was a small bloody movement of the bowels and upon opening the abdomen he found that by his manipulations all but the last inch of the intussusception had been reduced. The speaker said he did not believe he would ever again advocate the reduction of this condition by manipulation or injection. He inquired as to the choice of an anæsthetic in these cases in children under one year—whether it was better to employ chloroform or ether?

DR ERDMANN said that about a week ago he had been called upon to operate on two cases of intussusception in the course of four hours. Of his total number of 35 cases twelve had been fully reported in a published paper on the subject. Of the

remaining 23 cases, out of 19 that were operated on, there were five excisions, with five deaths, no recoveries. These patients were all under 1 year old. Out of 16 other operative cases, ten recovered and six died, the oldest of these was four and a half years. Of the 23 cases, fourteen were males, eight females, one not stated. In the majority of cases, the intussusception was of the ileocæcal, ileocolic, and ileocolocolonic type.

In regard to the presence of a palpable tumor in intussusception, Dr Erdmann said that in his paper on the subject he had made the statement that it was absent in 60 per cent of the cases, he would now reduce those figures to 40 per cent, providing the examination was made under deep anæsthesia. In the two cases he had seen recently, one was a child of 10 months with an intussusception of 4 days' duration. Reduction in this case proved extremely simple, while in the second case, which was of only 2 days' duration, it was more difficult. Both patients recovered.

In regard to the choice of an anæsthetic in these cases, Dr Erdmann said he now invariably used ether. He had formerly employed chloroform, and had seen one death result from it.

DR WOOLSEY said that what was found on operation in reducing an intussusception explained the uncertainty of the injection method, its partial success, and ultimate failure. The greater part of the intussusception in cases of short duration is easily reduced, but the last 2 or 3 inches are reduced with some difficulty, for the walls of the gut are infiltrated and thickened. The injection treatment may reduce the intussusception except the last few inches and not completely, causing temporary improvement in the symptoms, but in such cases the intussusception is soon reproduced.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY

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*Stated Meeting April 1 1907*

The President DR JOHN B ROBERTS in the Chair

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- (1) CHRONIC PANCREATITIS RESEMBLING CARCINOMA  
(b) A SERIES OF BREAST CASES BENIGN AND MALIGNANT  
(c) A SERIES OF GOITRE CASES

DR WILLIAM L. RODMAN reported these cases with presentation of patients. The first patient was a man of 56 first seen one year ago when he was suffering from jaundice and marked cachexia. He had lost 15 pounds and his symptoms were suspicious of carcinoma though no positive diagnosis was made. Opening the abdomen revealed in the head of the pancreas a densely hard mass large as a fist. This appeared to confirm the suspicion of cancer of that organ but because of the possibility of chronic pancreatitis the gall bladder was drained. The man was out of bed on the second or third day and made an unusually rapid and gratifying recovery drainage being kept up for 3 or 4 weeks. In the light of the results the case is regarded as one of chronic interstitial pancreatitis probably due to the habits of the man who used alcohol freely.

*Benign Tumors of the Breast*—Dr Rodman next presented three patients illustrating the results of plastic resection of the mammary gland for benign tumors. He was greatly impressed by Dr Warren's description of this method at the meeting of the American Medical Association in Portland and has since employed it in 17 or 18 cases regarding 15 of which he has full note. Two of the patients shown were the first and last of the series. All did remarkably well. The diagnosis of benign growth was made

in each instance and there has been no recurrence or evidence of malignancy in any of them. It should be remembered, however, that one cannot always be absolutely sure, hence the clinical diagnosis should always be supplemented by microscopic examination of the removed specimen, as the majority of mammary tumors are malignant and all of them potentially so. One of the patients was in the second month of gestation when operated upon for a fibroadenoma the size of a goose-egg, the largest one seen. Theoretically an incision in the lower part of the breast, and turning up of the organ, might interfere with its blood supply, but this objection does not hold good in practice, as the blood supply comes mainly from above. The incision is made along the line of junction between the gland and the thoracic wall. One might think this method applicable only to tumors in the lower quadrants of the breast, but in most of Dr. Rodman's cases the growth was in the upper and outer quadrant. Such tumors can be reached, as the breast can be turned upward to the clavicle. Functional activity and usefulness have been preserved in all the cases operated upon. The pregnant patient referred to was the sister of a prominent German surgeon, who insisted that this operation be done. Dr. Rodman is better pleased with the operation the more he uses it and believes that the profession too often sacrifices the breast. One has no right to remove that organ in those who use or expect to use it.

*Malignant Tumors of the Breast*—A second series included three cases of malignant tumor of the breast. The first is interesting for two reasons. The patient was the youngest he has operated upon for this condition, 25 years at the time of the operation 3 years ago. A second point is that last year he operated upon her mother for scirrhus. The second patient was operated upon in 1900 for a large carcinoma of the left mamma. The third has had both breasts removed, the first one 5 years ago for malignant disease, the other 2 years ago for a benign growth. The patient was so informed regarding the latter, but insisted upon complete removal, which revealed a large cyst with a small area of solid growth. Other interesting cases could not be shown. One was operated on in 1897, another in 1898, both for scirrhus, and both were in perfect condition a few months ago, the first had been operated upon twice before. A third case had been operated upon in 1899 and two others in 1900.

*Goitre*—Finally Dr Rodman presented two patients upon whom he had operated for goitre of which he has had 7 cases within 3 months one a large mediastinal growth The first patient has also a goitre on the left side which was not removed she nearly dying under ether when the right half was extirpated it being necessary to stop the ether three times The woman was pregnant when first seen operation being postponed until after delivery Pressure was evidently made by the growth of right side as difficulty in breathing has passed away and the patient is in all ways better than she was She was so anæmic that malignant disease was feared but the microscope showed this not to be the case Case second was that of a large goitre upon which operation was deferred for a few weeks until the patient who was profoundly anæmic had been put in good condition One of the silk ligatures has lately given some trouble this being the only one of buried Pagenstecher ligatures of which he uses 25 to 50 in each case to cause any difficulty A piece of the thyroid the size of the end of a finger was left The patient has since gained eight pounds a gratifying result Dr Rodman has never removed a goitre under cocain as he is certain general anæsthesia is not so dangerous as many believe it to be He would hesitate to attack such large goitres under local anæsthesia He employs ether and puts the patient in the reversed Trendelenburg position this aiding very markedly in the control of hæmorrhage

DR HENRY R WHARTON expressed his interest in the question of removal of non malignant growths of the breasts He has employed this method of turning up the breast in a few cases of small growth The operation was first recommended by Thomas of New York and is very satisfactory permitting removal of the tumor with little resulting scar

DR FRAZIER said that he had used the Warren incision quite recently in two cases In both instances the tumors were cystic and not solid The first one proved to be a galactocoele the sac of which was dissected out in toto In the second case a cyst of considerable size was exposed and removed through the same incision Microscopic examination of the tissue adjacent to the cyst demonstrated the fact that the cyst removed was only a part of a general cystic mastitis When this was discovered a second operation was performed at which the entire breast was removed together with a mass of enlarged glands near the anterior axillary



fold He was afraid upon finding these glands that a mistake might have been made in the diagnosis, but subsequent histological study proved that they were not malignant

DR JOHN H GIBSON said that until he witnessed Kocher's operations upon goitre he thought his own failure to relieve pain with infiltration anæsthesia in these cases was due to a faulty technique, but that now he thinks this was not the case Kocher's local anæsthesia consists entirely in an anæsthesia of the skin, the rest of the operation is carried on practically without an anæsthetic, and can only be borne by the Swiss peasants Kocher himself admits that in the more highly cultivated and organized patients he is obliged to use a general anæsthetic

#### MULTIPLE FRACTURES INVOLVING THE UPPER EXTREMITY

DR ASTLEY P C ASHHURST exhibited four patients who had sustained multiple fractures, and discussed the subject in a paper, for which see page 263

DR JOHN H JOPSON cited a case of multiple fractures treated in the Presbyterian Hospital as an illustration of the shock that results from such injuries An Italian was thrown from a wagon and sustained a fracture of the pelvis, the shaft of the humerus, one or both clavicles, and a Pott's fracture The fracture of the humerus was complicated by paralysis of the musculo-spiral nerve Shock was great and prolonged, but the patient made a good recovery There is now under his care in the Children's Hospital a child referred because of supposed rachitic deformities, who was found to have a fracture of the right thigh, both bones of the right leg, and both bones of the left leg, evidently of rachitic origin, and with no history of traumatism All surgeons are familiar with multiple fractures due to carcinoma In Dr Jopson's experience, the double Colles's fracture is the commonest example of multiple fracture encountered

DR GEORGE G ROSS mentioned two cases of multiple fractures One was in a woman of 65, weighing 250 pounds, and included a fracture of the middle of the shaft of the right humerus, a Colles's fracture of the right side and a Colles's fracture of the left side The patient recovered The second case was a multiple fracture of the upper extremity, including a fracture of the middle of the humerus and what corresponded to a Colles's fracture on the same side, though there had previously

been a fracture in that location. The man was violently drunk and no history could be obtained. There was great trouble in controlling the upper fracture.

DR WILLIAM J TAYLOR cited the case of a woman who had a fracture of one patella wired by another surgeon and afterward came to him with a fracture of the other patella. He wired that one but soon after recovery the woman got drunk and refractured it the bone breaking at the line of union and also in three other places. It was again wired but the woman again got drunk and fractured the patella a third time.

DR RICHARD H HARTE said regarding the question of repair in these cases he has noticed in a number of instances that nature appears capable of carrying on only a certain amount of repair that is multiple fractures do not unite so quickly as do single fractures. When three bones are broken some one of them will remain practically without union until the others have united and will then unite in the ordinary manner. It might be said that something was between the fragments preventing union but that is not the case the tissues simply lie dormant while the others are healing and then union promptly occurs. He is surprised that such a close observer as Dupuytren should state that multiple fractures unite as readily as does a single fracture.

DR ASHHURST in closing said that Dr Harte had apparently misunderstood his reference to Dupuytren's statements. The latter had referred to the union of multiple fractures with less inflammatory reaction in each than is ordinarily the case where only one fracture is present and by inflammatory reaction Dupuytren no doubt understood the formation of excessive callus as well as profuse suppuration the latter of course being a much more prominent feature of compound fractures in Dupuytren's time than it has become since the general adoption of antiseptics. In Dr Ashhurst's fifth case union did not begin in the forearm until that of the humerus was quite firm. Dr Ashhurst thought the treatment adopted by Dr Neilson in the first case reported was interesting in connection with the attempts now being made to secure union in ununited fractures of the neck of the femur without screw or wire fixation by freshening the bone fragments and then dressing the thigh in a plaster cast in the position of extreme abduction. In the humerus thus treated (Case 1) firm union had occurred without difficulty and in at least one case of

fractured femur of which Dr Ashhurst was cognizant, a patient under Dr Davis's care, the same result was obtained

### RHINOPHYMA

DR JOHN H GIBBON exhibited a case of rhinophyma upon which he had operated The patient was 57 years of age The condition had gradually developed in about 4 or 5 years The lateral aspects of the lower portion of the nose were covered with large pedunculated masses of hypertrophied tissue The whole lower half of the nose was involved, although over the central portion there were none of the pedunculated tumors

Dr Gibbon removed all of the hypertrophied tissue with a scalpel, shaving off the outer layers of the skin over the whole involved area The bleeding was quite profuse and there was an escape of a large amount of sebaceous material from the divided ducts and glands The bleeding was controlled simply by pressure The patient left the hospital without a dressing at the end of a week, and in two weeks the entire area was covered by new skin

### GALL-STONES WITH SUBACUTE PANCREATITIS

DR EDWARD B HODGE reported the case of a man, aged 27 years, who was admitted to Dr J H Musser's service at the Presbyterian Hospital October 30, 1906 Nausea, vomiting, sharp epigastric pain of 12 hours' duration Subject to similar attacks for some years Never had typhoid fever Examination showed moderate distension, slight rigidity of upper right rectus, distinct tenderness in the epigastrium, most marked over gall-bladder Pain extends to the left side, but not to the back or shoulder Later, gall-bladder could be felt and slight transient jaundice developed Highest temperature,  $101.4^{\circ}$ , pulse, 100, respiration, 20

Two weeks later, after attack had subsided, operation was performed in Dr DeForest Willard's service Right rectus incision Very extensive fat necrosis in omentum, mesentery, and subperitoneal fat Collection of purulent material between gall-bladder, liver, and pylorus, amounting to about 2 oz Gall-bladder not distended, and containing one large and a dozen small stones Dense adhesions about gall-bladder, ducts, pancreas, and pylorus

No stones felt in common duct Pancreas hard and head as large as a fist Tube drainage of gall bladder with gauze to ab cess cavity and right kidney pouch

Drainage never very free but patient did very well until tube was removed at end of three weeks Then followed fever enlargement of liver dulness and slight jaundice subsiding in a week This was followed by an attack of pleurisy at the left base and later by the discharge from drainage sinus of numerous pieces of necrosed tissue reported from the laboratory as probably fat necrosis This continued for several weeks with general condition poor Exploration of sinus and aspiration of left chest negative

*Second Operation*—Incision through scar Adhesions freed Cystic duct followed down to junction with hepatic and found kinked and strictured Hepatic and common duct unobstructed Cholecystectomy tube drainage of hepatic duct through stump of cystic Fat necrosis very much reduced though some small areas still present Pancreas reduced to nearly normal size Condition on table very bad but reaction took place Drainage free Later purulent bronchitis and septic nephritis developed ending in death on the tenth day No autopsy

#### RUPTURED ECTOPIC PREGNANCY DURING TYPHOID FEVER

DR F O ALLEN reported the case of a woman who was admitted to the Women's Medical Ward of the Presbyterian Hospital February 22 1907 and came under the care of Dr Musser She was 32 years old was married and had been ill for three weeks She had menstruated last at about the time she was taken sick The case seemed to be one of typical typhoid fever with an unusually large number and wide distribution of rose spots

The second day after admission some tenderness was noted on the left side of the abdomen At about five o'clock the following morning the twenty fifth day of her disease she complained of severe abdominal pain her temperature dropped to 98 her pulse became more rapid and very weak (at times imperceptible) and her respirations increased in frequency Intestinal hemorrhage was suspected and she was treated accordingly An examination a few hours later showed that abdominal breathing was restricted the abdomen was slightly distended but not tender peristalsis was present there was no loss of liver dulness there was no

dulness in the flanks The Widal reaction was reported positive, the leukocyte count was 19,200 The temperature remained subnormal throughout the day In the evening, the temperature rose again moderately, there was increasing tenderness of the abdomen, rigidity was not marked, but there was a distinct resistance, especially on the left side, she vomited, a bowel movement following an enema did not contain blood Her general condition became very bad, but improved somewhat after copious injections of normal salt solution beneath the skin

During the evening the patient was seen by Dr Wharton, who agreed with Dr Musser that operation was indicated, and that intestinal perforation was the condition probably present The speaker was indebted to Dr Wharton for the privilege of operating upon and reporting the case

Operation was done twenty-one hours after the onset of acute abdominal symptoms An incision was made through the right rectus muscle The peritoneum showed black in the wound, when it was opened, large quantities of blood poured out The ileum was drawn through the wound and inspected, but no perforation or other abnormal condition was found On exploring the abdominal cavity, the pelvis was found filled with blood and clots, which were scooped out by the handful A mass, the size of a small lemon, was felt, springing, apparently, from the left Fallopian tube The uterus was enlarged to about the same size and was soft The small mass had a distinct pedicle, and at its upper pole there was a rupture into which the finger could be passed The pedicle was ligated with silk, the abdominal cavity filled with salt solution, and the wound closed The mass was a thin-walled sack filled with clot No foetus was found

The patient's condition was considerably better during the following day, but the temperature soon rose and remained high, the lungs gradually became oedematous, and she died on the fourth day after operation

A complete autopsy was not permitted, but the wound was opened and the peritoneal cavity examined No signs of peritonitis or other intra-abdominal lesion were discovered, there had been no further hæmorrhage

DR HENRY R WHARTON said when he saw this patient the question was the differential diagnosis between hæmorrhage from an ulcer and perforation An enema brought away no blood,

hence perforation was considered probable though it was noted that the pain was in the left side and that there was not marked rigidity of the right side

DR JOHN B DEEVER asked if a differential leukocyte count had been made in the case reported by Dr Allen. He operated in one case which proved to be typhoid hæmorrhage the blood being confined to the intestine. There was absolute rigidity. The small intestine was found to be filled with blood and was not opened. The patient recovered.

DR WILLIAM L RODMAN cited a case in which typhoid perforation was diagnosed by two medical colleagues who insisted upon operation although he did not favor it. When the abdomen was opened hæmorrhage was found in the gut but no perforation. *The patient recovered from the operation but died from a second hæmorrhage a number of days later.* Autopsy showed there had been no perforation. If one opens the abdomen in these cases he is probably warranted under certain conditions in opening the intestine and searching for the bleeding point but in general the chances are better if the hæmorrhage be allowed to take its course. There is not a large field for operation in typhoid fever and one is not warranted in opening the gut unless there are adhesions or thin places in the wall make the finding of the bleeding point reasonably sure after the opening has been made.

#### BONE METASTASES IN CARCINOMA OF THE BREAST

DR HENRY R WHARTON read a paper with this title for which see ANNALS OF SURGERY for July page 81.

DR MORRIS BOOTH MILLER described a fracture following operation for carcinoma of the breast in a woman of 40 the thorough operation having been performed. The patient when coming from the seashore where she was during convalescence was holding on to the seat to steady herself while standing in a street car. A slight jolt was followed by sharp pain in the arm and examination revealed an oblique fracture of the humerus. This suggested a recurrence though there was no thickening of the bone and only the signs of an ordinary fracture. Demonstrable metastases occurred and the woman died the following winter.

DR JOHN B DEEVER said that Osler in 1902 reported 16 cases of carcinoma of the spine following carcinoma of the uterus or breast.

DR WILLIAM L. RODMAN said that bone metastases in breast tumors are not particularly common, yet they are not extremely rare. Personally he has seen three cases. Two were unquestionably scirrhus carcinoma, the third was a sarcoma. In one of the carcinomas the metastatic growth was in the spine, the other in the left humerus, the same side as the primary tumor. The metastasis of the sarcoma was in the right femur six months after operation. The patient was the daughter of a prominent surgeon and had carried a benign growth for years.

Metastasis in sarcoma is more easily understood as the cells are in contact with the wall of the vessels, while in carcinoma the vessels are in the stroma. He has seen many cases of bone involvement in the sternum, but there the reason is very plain. Of indirect infection he has seen only the two cases, it not being difficult to see how metastasis to the spine occurs. The retro-mammary lymphatics drain through the second and fourth interspaces and then run along the course of the intercostal arteries to the thoracic duct. In this way spinal metastases occur. Dr Wharton said that primary cancer of the bone is rare, he questions if it ever occurs, as epithelial cells are not found in bone. Such tumors are really endotheliomata or sarcomata. Bone metastases are important as they are never located before operation. The same chains of lymphatics as previously mentioned also explain metastases to the liver, this being the most common site of the secondary growths.

DR JOHN B. ROBERTS saw eight years ago a case similar to that reported by Dr Wharton. He was not able to determine if a growth was present, but regarded it as probably a case of spinal metastasis.

#### FIBROMA OF THE GREAT TOE

DR HENRY R. WHARTON reported the case of a man, aged 50 years, who noticed 12 years before he came under the care of Dr Wharton a tumor of the right great toe, it was painless, but increased gradually in size. He found it necessary to have the shoe for the right foot made upon a special last to accommodate the increasing bulk of the tumor. A casual inspection of the feet with the shoes on showed no marked difference in their size. Within a few weeks a portion of the tumor had ulcerated and gave him pain, which caused him to apply for relief.

The tumor was a fibroma and was attached to the peri-







osteum It was removed without difficulty the wound being covered by skin flaps dissected from the tumor See Fig 1

## POST OPERATIVE TREATMENT

DR JOHN H GIBBON read a paper with this title for which see page 298

DR JOHN B DEAFER endorsed much that was said by Dr Gibbon He believes however that instead of patients being neglected they receive too much attention His motto for the house physician is Let the patient get well No medicine should be given after an operation as a rule He is opposed to the indiscriminate and routine use of strychnin He employs nothing but ether as an anæsthetic being afraid of chloride of ethyl as he has heard of deaths from it Giving the anæsthetic is an important thing and ether usually does no harm It is best to anæsthetize the patient on the operating table as it is a mistake to move him there after ether is begun this always meaning an extra amount of the drug The patient may be anæsthetized in the high pelvic position even the intestines thus being floated up and requiring less packing when the operation being an abdominal one is begun When operating upon the upper abdomen he always has the patient wrapped in cotton and put upon a hot water bed the cotton is at once removed when the patient is taken to his room

As to scopolamin Dr Deaver does not know what it looks like and is thankful he does not Tight sutures as stated by Dr Gibbon make trouble he usually places a drain in stout walls for a day He was sorry to hear Dr Gibbon say he uses morphin after operations Dr Deaver would at once discharge a resident if he did that Its immediate effect is to make the patient more comfortable after that it makes him more uncomfortable It creates more thirst and often more nausea Occasionally he employs morphia but never as a routine measure He administers oxygen immediately after operation and this lessens nausea that fact being noted in the German Hospital by the Sisters who have been on duty for fifteen to twenty years A careful nurse is of more moment than a hypodermic of morphia There is not so much in the use of morphia after gastro enterostomy as formerly supposed When this operation is performed by making the communication with the jejunum as near as possible to its commencement vomiting does not occur

Dr Deaver never sees shock, except in cases of hæmorrhage or prolonged operation or bad anæsthetization. The pulse of his patients after short operations is always about 84 to 90. Getting the patient out of bed early is an important point. Cases of hysterectomy are gotten out in a week and are encouraged to turn on their side early. Many of the cases of phlebitis, formerly so frequently seen, were due to lack of these measures. As regards passing the catheter, he allows hernia patients to get up to pass urine, worse results than are made possible by this come from catheter cystitis. He never operates upon an empyema without first aspirating it.

DR WILLIAM L. RODMAN now has largely the opinion of Dr Gibbon regarding morphia, though formerly he was afraid of it. Since its use he sees much less post-operative vomiting. Perhaps it is unwise, however, to use it as a routine measure. He has never known a gastro-enterostomy to give trouble when morphia is given. There is less shock and less anæsthetic is necessary. A quarter grain of morphia and one one-hundred and fiftieth grain of atropia are invariably given in cases of gastro-enterostomy. Of seven recent cases only one patient vomited, and that one only once. We give anæsthetics much better now than formerly and do not see so much distress from their use. When ether is given by the drop method there is but little post-operative vomiting, with or without morphia. Dr Rodman prefers chloroform in empyema cases, of which he has operated upon 100 to 150 without losing a patient, and has never seen any ill results, with ether these cases are more unpleasant. Patients should be gotten out of bed early, especially the subjects of cancer, who should be out in 48 hours. If such persons, particularly when the cancer was in the abdomen, are kept in bed a few days they never get out. The possible development of a ventral hernia is not to be regarded in these cases. In gastro-enterostomy for cancer of the stomach, the patient should be out of bed the day following the operation.

DR WILLIAM J. TAYLOR finds that patients occasionally are benefited by washing out the stomach before they are out of the anæsthesia. This is especially true in cases of intestinal obstruction or in emergency operations where previous emptying of the bowels has not been possible. Food should not be given too soon. He had rather keep a patient three days without food than to give

milk and soup and have it ferment in the intestine instead of digesting

DR RICHARD H HARTE does not believe in the indiscriminate use of morphia in operative cases. He believes that the routine dose of a quarter grain of morphia before a patient is etherized is in time liable to lead to serious results numerous cases being reported where this dose has been fatal. As a rule the less medicine given after operation the better for the patient. Invariably the bowels if left to themselves will move in the course of two or three days. Their action can however be supplemented by the use of a simple enema. Dr Harte lays great stress on the importance of keeping patients warm and dry during operation avoiding exposure as much as possible as shock is often induced by air coming in contact with wet clothing as well as by prolonged unnecessary manipulation of the intestine. Fortunately this latter is less noticeable now as the non operative field is pretty well shut out by the judicious use of pads of gauze.

The early feeding of patients is unquestionably a great error as food introduced into the bowel too soon only ferments and causes an immense amount of discomfort. Patients are as a rule much better by waiting 24 to 48 hours before any food is ingested and even then if there is any question of irritability of the stomach they can be readily nourished by the bowel. Thirst which is so common in post operative cases can be relieved by keeping the bowel filled with normal salt solution.

DR JOHN B ROBERTS said that post operative backache is not due to operation itself or to the fact that the patient is kept in bed but is usually caused by the flat operating table upon which the patient lies during anæsthesia and operation. A hard pad should be placed on the table under the lumbar region of the patient. A hard mattress is also too flat. The table ought to be made to fit the curves of the back so that the muscles and ligaments may not be strained during a long operation. For 18 or 20 years he has given before almost all operations a quarter of a grain of morphia and one one hundred and fiftieth of atropin hypodermically. *Less anæsthetic is required there is less interference with breathing by mucus and the heart is strengthened by this preliminary to anæsthesia.* He has never known it to hurt a patient. The curse of thirst due to the operator insisting that abdominal cases should have no water to drink till hours have

elapsed, should be avoided by all sensible surgeons. The unnecessary torture thus induced should meet with the strong condemnation of the profession. Dr Roberts has always contended, since the rise of abdominal surgery, that its principles are identical with those of general surgery, and has acted on that belief. A little morphia before anæsthesia and water afterwards do no harm in either case. Another point in post-operative treatment is that nurses nearly always put patients on the stretcher without a pillow under their heads, a low pillow surely can do no harm and is much more comfortable to the patient than to lie with the head thrown backward on the bed.

DR JOHN B. DEEVER said regarding backache being due to flat tables, he has noted that few gall-stone patients complain of their backs after operation. This would indicate that Dr Roberts is correct in his statement about the lack of support to the back.

DR GEORGE G. ROSS wondered how many of the surgeons present had suffered as have the patients they were discussing? He had had his appendix removed, and the following night suffered the tortures of the damned. One of his friends surreptitiously gave him a morphin suppository which afforded great relief. The nurse brought in a large bowl of ice, which he did not interfere with until the ice all melted, when he drank every drop of the water. And this was not followed by vomiting.

DR GIBBON, in closing, said that he agreed with the other speakers that as few drugs should be used after operation as possible. He emphasized the fact that in using morphia in the manner described it formed rather a part of the anæsthetic than of the after-treatment. Dr Deever's dissatisfaction with the use of morphia was the result of using it after, and not during or before, anæsthesia. It has not been Dr Gibbon's experience that distension follows its use in the way described. His own personal experience after an operation for acute appendicitis had confirmed him in the value of the ethyl chloride-ether-morphia sequence. He slept comfortably for four hours after his operation was not at all nauseated, and had no taste or smell of ether. He said that he should have mentioned in his paper the great value of washing out the stomach, especially in those patients who had not been properly prepared for operation.



# THE MILITARY SURGEON

The Journal of the Association of Military  
Surgeons of the United States

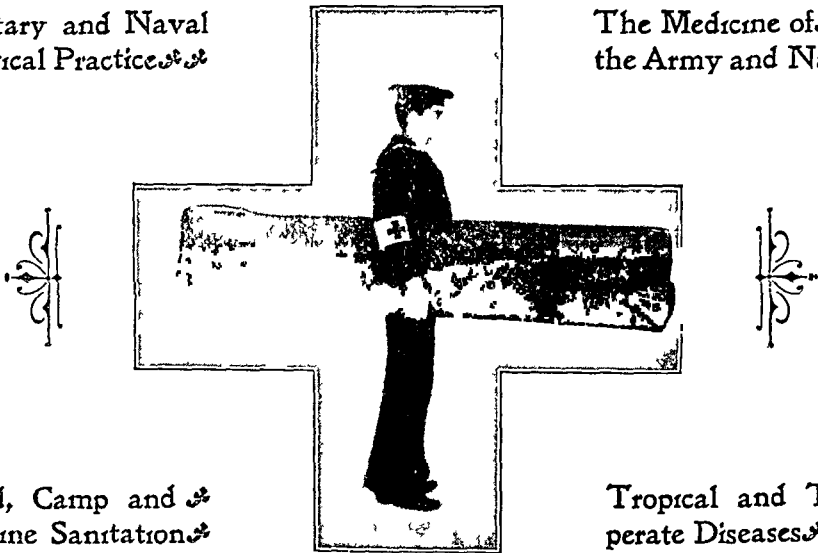
EDITED BY

James Evelyn Pilcher, M.D., Ph.D., L.H.D.,

Major and Brigade Surgeon of United States Volunteers,  
Captain, Retired, in the United States Army

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## JAMESTOWN EXPOSITION

For combined beauty of location and historical interest there has never been, at least since the Centennial celebration at Philadelphia in 1876, an exposition in America that is comparable to that now in progress at what was once Jamestown, Va. For countless thousands of Americans, scattered from ocean to ocean, Jamestown should be a Mecca as truly as Plymouth is. It is the cradle of English civilization in America, for here in 1607, thirteen years before the Pilgrim fathers landed at Plymouth Rock, Captain John Smith and his coadventurers planted the English standard on the marshy banks of the river James. In another aspect, too, the place is of interest, for off the shore in Hampton Roads occurred, in 1862, the first engagement between ironclads ever fought, the memorable battle between the Monitor and Merrimack.

We have become so used to expositions since the World's Fair at Chicago in 1893, that there is some danger of our neglecting this celebration at Jamestown. The backward season and unfortunate delays in the completion of the exhibition have militated against it, but there ought to be no doubt as to its real success. Jamestown is unusually accessible not only by rail, but by water. Never before has any exposition been located that visitors from as wide an area could reach it so readily by water routes, the pleasantest method of traveling in summer. Every one who has a vacation ahead should consider at least including it in his itinerary.

## PEROXIDE SOLUTIONS IN OTOLOGICAL PRACTICE

Bruder (Revue Hebdomadaire de Laryngologie) calls attention to the unpleasant results which have followed the careless use of peroxide solutions, or those of inferior and unreliable grade, in otological practice, such as diffuse external otitis, cerebral symptoms, suppurative phlebitis in the lateral sinus, etc. In one case fatal cerebellar meningitis followed the use of an impure peroxide. The mentus should be smeared with vaseline before any form of peroxide is used, and if unpleasant symptoms follow, the peroxide should be discontinued. In case of cholesteatoma, especially in operations on the mastoid, with sinus phlebitis and extradural abscess, the remedy should be used with great caution. With these restrictions,

the remedy can be profitably employed. The great point for consideration is the purity of the product, and ample evidence has shown that there are very few suitable peroxides on the American market. Dioxogen has the advantage of absolute purity with stability, found, probably, in no other peroxide, and, in otological practice, its use has been found not only efficient but absolutely safe—"The Chicago Clinic and Pure Water Journal."

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Dr. E. L. McKee, of Cincinnati, Ohio, speaking of Codeine, in the *Denver Medical Times*, says—"This drug, according to Butler, is one-fourth as toxic and effective as morphine. It is less depressing and more stimulant, does not constipate, cause headache or nausea, and rarely leads to the formation of a habit. Codeine seems to exert a special, selective, sedative power over the pneumogastric nerve, hence its value in irritative laryngeal, pharyngeal, and phthisical coughs with scanty secretion. Like morphine, it has proved of value in checking the progress of saccharine diabetes, and it has been used for long periods without the formation of the drug habit, inasmuch as when glycosuria was brought to a termination by dietary and other measures, the cessation of the use of codeine was not followed by any special distress. The effects of codeine on the alimentary canal are remarkable, in that it assuages pain as well or better than morphine, and nevertheless does not check the secretions or peristalsis notably, unless the latter is excessive, as in dysentery. The statement that codeine is simply a 'little morphine,' only differing from the latter in the size of the dose, is an erroneous view, as can be ascertained by any one who closely observes the action of the two drugs."

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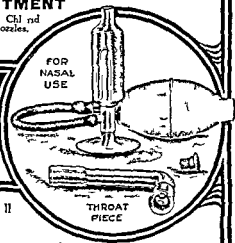
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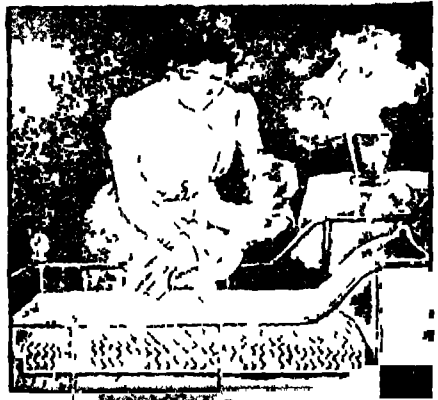
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*Assistant in the Clinic of Hofrat von Neusser, Vienna*

Translated and edited by

**HANS ZINSSER, M D., and KARL M VOGEL, M D**

*Assistant in Bacteriology, College of Physicians and Surgeons, Columbia University, Assistant Pathologist, St Luke's Hospital*

*Assistant in Pathology, College of Physicians and Surgeons, Columbia University, Assistant to Attending Physician, St Luke's Hospital*

It is rather strange that the literature devoted to the study of pain as a symptom is so scanty, and the average practitioner—and certainly the average recent graduate—are far from being properly qualified to utilize to the full extent the diagnostic aid it affords or to undertake its relief with an adequate comprehension of its pathogenesis

It is therefore a matter for congratulation that this topic has been made the subject of an exhaustive analytical study by an authority of undoubted eminence Dr Rudolph Schmidt, who for more than ten years has held a teaching position in the world-famed clinic of von Neusser in Vienna, which has always been celebrated for the thoroughness of its clinical instruction, has written a volume on pain and its diagnostic significance which affords a striking demonstration of how unjustly this important field has been neglected

The volume consists of an accurate and thorough analysis of the various painful sensations that occur in the internal diseases, their mode of causation, and correct interpretation. The author discusses the manner in which they are affected by the positions of the body, motion, pressure, the ingestion of food, remedial agents, functions of organs, their topography, and especially their relations to the different diseases and their diagnostic indications

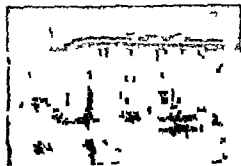
In the first section the subject of pain in general and of its occurrence in the various regions of the body is set forth, while in the second each organ and organ system is taken up at length, and detailed discussions are devoted to the pains accompanying diseases of the nervous system, the organs of locomotion, the gastrointestinal canal, the liver, the pancreas, the genito-urinary system, the spleen, the lung, the aorta, and the peripheral vessels

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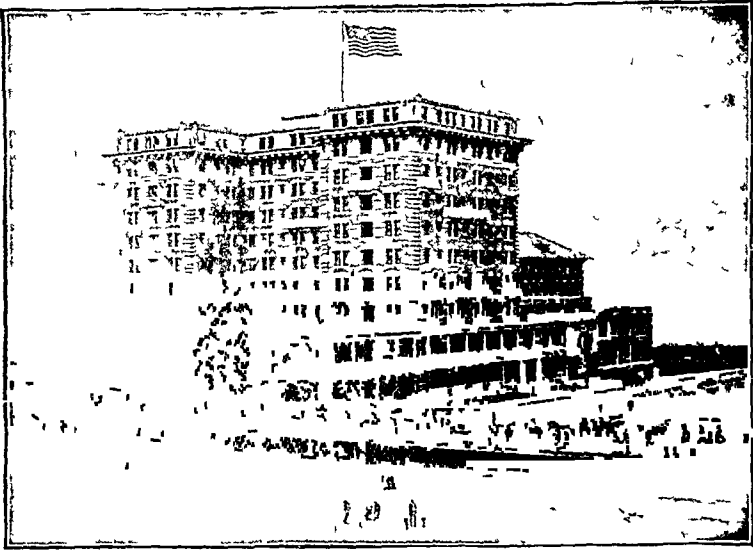
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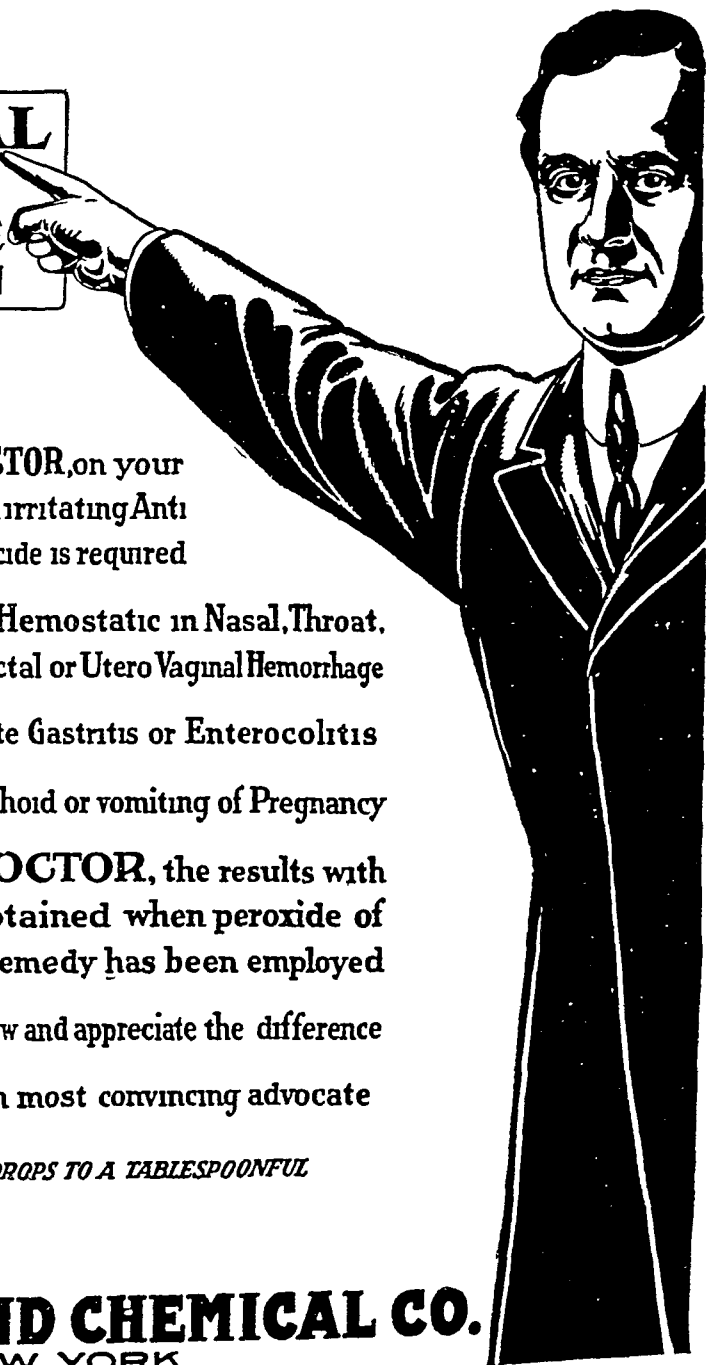
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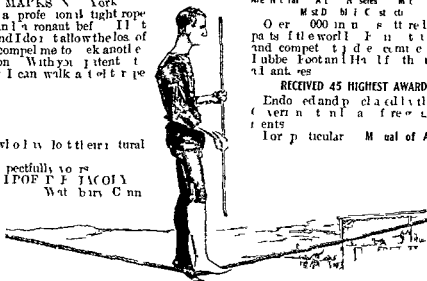
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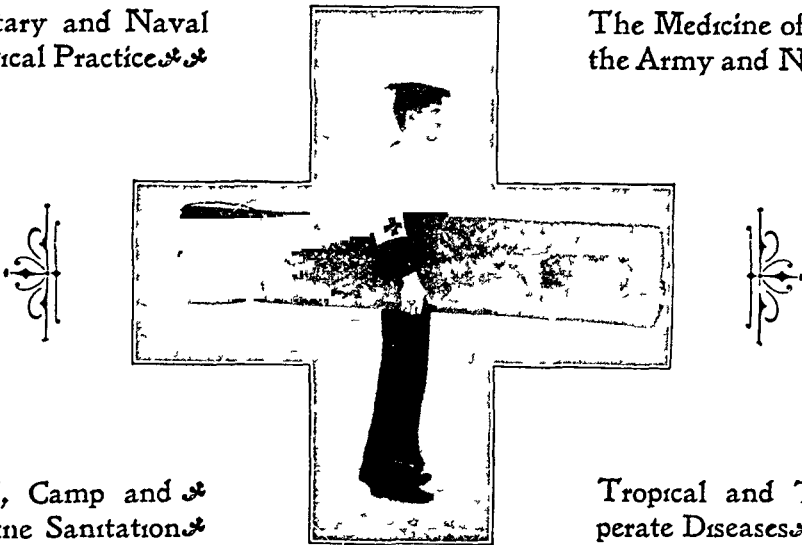
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# ANNALS OF SURGERY

VOL XLVI

OCTOBER 1907

No 4

## ORIGINAL MEMOIRS

### THE PARATHYROID GLANDULES THEIR BLOOD SUPPLY AND THEIR PRESERVATION IN OPER ATION UPON THE THYROID GLAND

BY WILLIAM S HALSTED MD

OF BALTIMORE

AND

HERBERT M EVANS SB

OF MODESTO CAL.

THE BLOOD SUPPLY OF THE HUMAN PARATHYROID GLANDULES HERBERT M EVANS The vascular injections and studies herein reported were made to determine accurately the exact source and position of the blood supply to the parathyroid glands in man. Another aim that of knowing more of the angiology of the parathyroid gland itself was also served but this subject will be reported separately at a later date. I would here express my indebtedness to Professor Halsted at whose suggestion the problem was undertaken to Professor Mall in whose laboratory the injections were made to Professor W G MacCallum Dr H E Helmholtz and especially Dr Marshall Fabian who have kindly given me many opportunities to secure fresh human material and to Mr Broedel whose advice I found invaluable in the execution of the drawings

*Methods*—Recent studies in the finer anatomy and histology of mammals have shown many distinct differences so that it would be no longer justifiable to assume that the findings in the dog, for example, must be identical with those in man. Such a contention is especially strengthened in this particular case by the variation in the size and position of the parathyroid bodies in the animals which have thus far been investigated. With a full realization of this, all of the present work was done on human material. Very different circulatory relations than are here reported may be found in all those animals in which the parathyroid glands are imbedded in the thyroid. In the majority of cases the specimen was secured a few hours after death, the entire neck organs being removed en masse. The upper and lower poles of each lateral lobe of the thyroid were then carefully dissected sufficiently to identify the superior and inferior vessels in each case. In most instances, the superior arteries were ligated and the injection mass delivered through the inferior vessels, but in several cases the upper arteries were injected in addition. Though anastomoses generally permitted a partial injection of the opposite side, the two sides were always separately injected. Mercuric sulphide (vermilion) granules in a twenty per cent gelatin solution were most often used as an injection mass and gave a splendid arterial injection which when long-continued could be made to invade the capillary bed. In several cases, the veins were filled with ultramarine blue and in still others the arteries were injected with india ink which enters the capillaries with great facility. The entire specimen was immediately cooled in running water and a preliminary dissection made to locate the parathyroid glands. This seemed wise inasmuch as the detection of these glandules was easier in fresh material, in which the natural brownish color was retained, than in specimens in which they were blanched by the preserving fluid. A simple sketch of the position of the parathyroids was then made to be used in identifying them in the final dissection. The specimen was placed in a ten per cent formalin solution for twenty-four hours, after which the tissues were sufficiently preserved to permit a careful dissection to be

made. Such dissections were accurately charted. Generally the parathyroid glands were ultimately removed, dehydrated in alcohols and cleared in creosote for further study.

*Observations*—Few studies of this region based on actual vascular injections have been made. However D. A. Welsh<sup>1</sup> whose excellent paper appeared in 1898 used the injection method. It is unfortunate that no figures of the vascular relations accompanied his study.

One of the first facts which appears after a satisfactory injection is that a special tiny parathyroid artery supplies this gland in every case. This artery may arise from one of the glandular, the muscular or the œsophageal branches of the inferior thyroid artery, but wherever its origin it can be seen definitely to supply the parathyroid gland and it alone. One may sometimes see one or two smaller arteries accompanying the parathyroid vessel, but they supply the small fat mass which often surrounds the parathyroid or lies on either side of it; my injections have never demonstrated more than one parathyroid vessel proper, and this enters a distinct hilus in the gland. Though practically all previous studies have not shown any real embedding of the human parathyroid in the tissue of the thyroid, the connective tissue envelope which surrounds the latter gland often appears to split to enclose the parathyroid. It was interesting then to observe what vascular connections existed between the capsule of the larger and the smaller glands. Complete injections have uniformly shown only the scantiest blood supply to this connective tissue investment. It usually consists of a few minute vessels, for the most part capillaries. These are seldom seen to be in any relation with the parathyroid glands and never to be connected with the vascular system of the latter, which is always from the parathyroid arteries. This fact was more striking when observed in a rather unique case in which I found the parathyroids so deeply set in the surface of the thyroid that their surface was barely level with that of the larger gland. Here also there was

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Welsh D. A. Jour. of Anat. and Physiol. 1898.

a definite independence of the vascular system of the parathyroid from that of its immediate surroundings. It is thus quite unlikely, even if not inconceivable that the true capsular vessels of the thyroid could nourish the parathyroids and in those cases in which the lower parathyroids lie below the lower pole of the thyroid, it is all the more improbable.

In practically every case studied, the lower parathyroid artery came from a prominent branch of the inferior thyroid artery. Ten entire specimens were found suitable for accurate plotting. This would ordinarily give twenty opportunities for examining the inferior parathyroid artery, but since the gland was not found in one instance, the actual number of observations was nineteen. In six instances the inferior parathyroid gland was clearly below the lower margin of the thyroid, and the parathyroid artery in these cases coursed as a distinct, usually unbranched, vessel to the hilus of the glandule. The findings of others would indicate that so great a proportion of these cases is probably a unique experience. In such cases, the parathyroid artery has measured between two and three centimeters in length, in all other cases its course is seldom in excess of four or five millimeters.

The upper parathyroid gland invariably has a short artery of supply which may arise from one of the main branches of the inferior thyroid or from an anastomosing ramus joining the superior and inferior thyroid arteries. A very prominent anastomosing channel was found along the posterior margin of the lateral thyroid lobe in eight of twenty instances and in these cases the superior parathyroid artery was a short branch from this channel. Most often, however, the angle at which the parathyroid vessel came off from its parent trunk suggested strongly that its blood stream was usually from the inferior source.

The conditions found thus varied somewhat, but with the constant features just emphasized. The special picture presented will depend to a considerable extent on the position of the parathyroids, and using this as a sort of basis of classification three common types may be specified. Figures 1 and 2

illustrate two varieties of what may be called the first type. Here the upper parathyroid lies along the posterior border of the lateral lobe of the thyroid somewhat above the mid point between the upper and lower poles the lower glandule lies near the lower thyroid margin or pole. It is not unlikely that this particular arrangement will be found occurring most often in a large series of cases. In Fig 1 the lower para



Fig 1

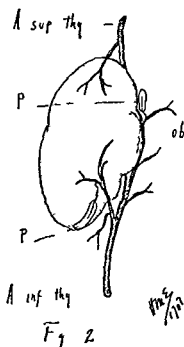


Fig 2

thyroid artery is seen to arise from the prominent lateral branch of the inferior thyroid artery which supplies most of the outer surface of the lateral thyroid lobe. The upper parathyroid artery here arises from the strong anastomosing channel between the upper and lower thyroid vessels which courses along the posterior border of the lateral lobe. In Fig 2 the lower little artery comes from one of the lateral glandular ramus of



the inferior thyroid, while the upper one happens to be a branch of the uppermost oesophageal ramus

Figs 3 and 4 will illustrate a type but little removed from that just discussed, but one in which the parathyroids are rather symmetrically disposed, the one above, the other below the mid-point between the thyroid poles. The condition shown

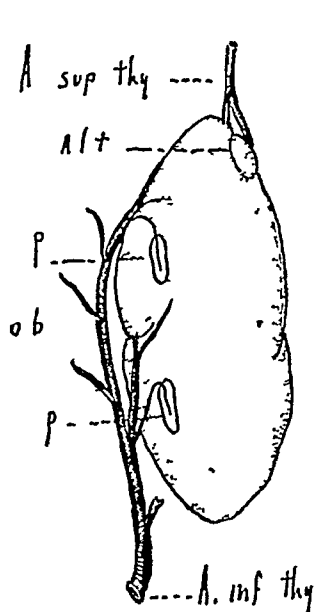


Fig. 3

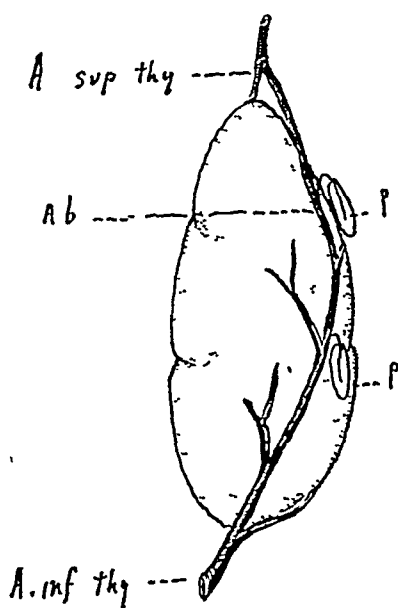


Fig. 4

in Fig. 4 is interesting since here both parathyroid vessels came from the same large branch of the inferior thyroid, which in this case communicated with the superior thyroid artery

In the third type, shown in the remaining two figures (5 and 6), is depicted the arrangement seen in those cases in which the lower gland is appreciably below the lower margin

of the thyroid Here it is not unusual to find a relatively long parathyroid artery

Various other modifications in the exact plan of blood supply were found but in general the figures given illustrate the chief conditions

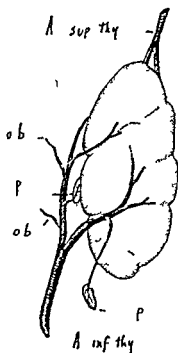


Fig 3

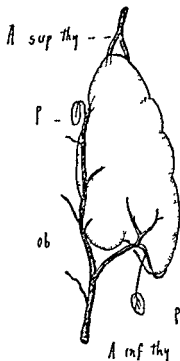


Fig 4

It is without the purpose of this communication to follow the behavior of the parathyroid artery after it enters the glandular hilus but it may be said here that in general this vessel pursues a central course giving off obliquely directed branches which ramify peripherally eventually giving origin to capillaries This picture may be seen beautifully in cleared specimens of the glandule and it may be pointed out is in

contrast to the scheme of circulation which obtains in the case of the thyroid gland

The chief facts brought forward in the present report may be summarized as follows

1 The parathyroid glands are always supplied by definite parathyroid arteries which enter them in each case at the hilus

2 The parathyroid arteries, superior and inferior, usually arise from the inferior thyroid, but frequently they take origin from the anastomosing channel, described above, between the inferior and superior thyroid vessels. Additional types of origin of the parathyroid artery have been described and figured

3 Few, if indeed any, direct vascular connections normally exist between the parathyroid glands and the connective tissue envelope of the thyroid

THE PRESERVATION OF THE PARATHYROID GLANDULES IN OPERATION UPON THE THYROID LOBES. WILLIAM S HALSTED. With our present knowledge, scant as it is, of the function of the parathyroid bodies comes not only the recognition of the necessity for their preservation but more frequent occasion for operations which imperil the vitality of these little life sustaining organs

When tetany was believed to be due to thyroid privation the surgeon feared to operate upon both lateral lobes of the thyroid gland, having learned that the death rate from total excision of this organ was very great, and, that tetany, the chief cause of this mortality, might follow the excision of merely one lobe of the thyroid gland or ligation of two or even of one of the four thyroid arteries

As long ago as 1889 it was discovered that dogs would survive the gradual excision of as much as thirty-one thirty seconds and of even a greater proportion of the thyroid gland provided the fraction remaining was the superior pole of either lobe. That tetany did not result was due to the fact, not surmised until the appearance of Gley's superb contributions in 1891, that the superior parathyroid body, situated in the dog very near to and usually a little above the superior pole of the

thyroid lobe had escaped destruction by this method of piecemeal excision from below upwards of the thyroid gland. In man however with gradual piecemeal amputation from below upwards of the thyroid lobes destruction of all of the four parathyroid glandules would as a rule already be accomplished with the removal of the lower two thirds approximately of each lateral lobe (vid figs 2 3 and 5). But even before it was ascertained that the parathyroid bodies had any function whatever a long series of happy accidents demonstrated that total excision of the thyroid gland might in man be survived in about fifty per cent of the cases in many instances moreover there was entire absence of symptoms of thyroid as well as of parathyroid insufficiency.

Only now that the function of the thyroid gland and the parathyroid glandules may no longer be so confounded are we in a position to determine the amount of each of these organs likely to be necessary in a given case to prevent the occurrence of symptoms of deficiency of either. And even before this has been more definitely determined surgeons are justified in proceeding with greater intrepidity in operation involving the sacrifice of the thyroid and threatening the destruction of the parathyroid glands believing that the symptoms of privation of each may be mitigated or entirely negated by the administration in some form of the nucleoproteids or whatever substances are lacking.

In the mean time our plan of operating not only for the *exophthalmic* or *hypertrophic* forms but also for the *colloid* degenerative or *atrophic* varieties of goitre may be modified in conformity to our recently acquired knowledge of the function of the glandulæ parathyreoides. In place of the unilateral operation heretofore almost exclusively practiced in cases of colloid or other nonhypertrophic varieties of goitre a bilateral

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The patient suffering from hypoparathyreosis whose history is reported in the July number of the *American Journal of Medical Sciences* is rapidly being restored to health by the administration hypodermically of the nucleoproteid of the parathyroid glands of bees supplied me most kindly by Prof S P Bebe of Cornell N Y.

operation might be substituted in some cases, and in the hypertrophic goitres, the one lobe should be so operated upon, that, in case of need, the other may be subsequently attacked without danger of parathyroid privation. Even in the absence of the existing vital reasons which contraindicate the sacrifice of a single parathyroid glandule, the fact that these little organs perform some highly important function is sufficient reason for the endeavor to preserve all of them.

Although for more than a decennium we have known that operative tetany is due to loss of parathyroid tissue more cases of this affection have followed operation during this time than in the preceding quarter century, and, furthermore, at the hands of the operators most experienced in the surgery of the thyroid gland.

Dr MacCallum, who has carefully studied the operative material from about eighty cases of exophthalmic goitre operated upon by the writer, reports having found in perhaps seven instances one parathyroid with the excised lobe. During the past two years this glandule has only twice, I believe, been excised by me with the thyroid lobe. Nevertheless it is quite certain that in most instances of complete excision of one thyroid lobe as reported by surgeons the world over both parathyroid glandules of the operated side have been sacrificed whether the trunks of the thyroid arteries were tied at some distance from the gland or the ultimate branches of distribution at their points of entrance into the thyroid lobe, and even when that portion of the thyroid in which the parathyroid glandules are quite uniformly found has been resected and left undisturbed, the latter bodies were undoubtedly often destroyed.

It is in the control of hemorrhage that we sacrifice the parathyroid glandules. But the hemorrhage must be controlled and thyroid vessels must somewhere be divided in the operation for the removal of a lobe of the thyroid gland. May they be so divided and secured as not to cut off the blood supply of the parathyroid glandules? Reply to this question is impossible without definite knowledge of the blood supply of these little bodies.

Dr Mall did me an invaluable service in recommending Mr Herbert M Evans of the class of 1908 of the Medical School of Johns Hopkins University as one particularly well equipped for making the investigations Mr Evans<sup>a</sup> undertook the work with enthusiasm being interested both in the anatomical and the surgical aspect of the problem Upon his report which precedes this paper is based

*The Situation of the Parathyroid Bodies*—Their position in man is in general much lower than in dogs the higher of the two glands of one side being on the average about at the level of the junction of the upper and middle thirds of the lateral lobe of the thyroid gland Occasionally a parathyroid is found as high as or even above the superior pole of the thyroid gland In one instance at the operating table I happened to find a parathyroid above the level of the superior pole of the thyroid gland The lower of the two glandules rarely as high as the middle of the thyroid lateral lobe is usually not far from the lower pole but may be several centimetres below it—even within the bony thorax With great regularity these little epithelial bodies are situated on or very near the posterior border of the lateral lobe of the thyroid gland and more or less in line with an important landmark the channel of anastomosis between the superior and inferior thyroid arteries

*The Blood Supply*—As determined by Mr Evans each glandule has invariably its special artery which might be designated the superior and inferior parathyroid artery right and left This little vessel surprises one by its size being large in proportion to the organ supplied and thus aids in the identification of the epithelial body The parathyroid artery is particularly serviceable as a guide to the parathyroid gland when the latter is enveloped in fat Ordinarily these glandules are quite free and as cherries on the stem hang from the artery which as described by Mr Evans enters its hilus

The usual shape of the bodies is indicated in the drawings

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In another communication Mr Evans will give in greater detail the result of his study of the circulation of the parathyroid glandule

They are ordinarily ovoid and flattish, presenting a sharpish edge which may as a rule be easily curled or folded. The surface markings which give the glandule an exceedingly fine, barely visible granular appearance are probably due to the blood vessels. Differentiation from adipose or thyroid tissue is rarely difficult unless the natural appearances have been obscured by trauma or staining.

*To Save the Parathyroid Glands in Performing Thyroid Lobectomy*—We have seen that from the superior and inferior thyroid the parathyroid arteries almost invariably arise, but we may assume that by the way of the œsophageal or other branches of anastomosis a number of parathyroid glands have been rescued, otherwise it would be difficult to explain the large percentage of recoveries which followed simultaneous ligation in man of all four of the thyroid arteries in the total excisions of a quarter of a century ago. It is important to note that these excisions were not undertaken for the hypertrophic forms of goitre.

Total extirpation performed in this manner in cases of Graves' disease would, perhaps, rarely fail to be followed by tetany. But it frequently happens that more than one lobe, or indeed that the greater portion of both lobes has, in two or more acts, to be removed in hypertrophy of the thyroid gland.

The "subcapsular" procedure of Dr Chas H Mayo, is, I believe, correct in principle, and, with the proper observance of details, for knowledge of which we are indebted to more complete acquaintance with their vascular supply, one or perhaps both parathyroid glandules of a side may be saved. But only with the exercise of the greatest caution, for, between the point at which the branch giving off the parathyroid artery enters the thyroid lobe and the origin of the latter vessel, there may be hardly room for one fine pointed artery forceps and not space for a broader-nosed clamp, as, for example, the admirable instrument of Ochsner, and still less for two clamps.

On two occasions, recently, in the operation for exophthalmic goitre, there was not room even for the fine point of our "mosquito clamp," and twice I deliberately cut off the blood



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supply of the inferior parathyroid gland seeing no alternative save preserving a portion too considerable of the thyroid lobe. On several occasions operating for exophthalmic goitre I have transplanted into the thyroid gland a parathyroid glandule which had been deprived of its blood supply.

The drawings of Mr Evans happen to be made from specimens which do not illustrate this point particularly well but in figures 2 and 7 the inferior parathyroid is given off from a branch of the inferior thyroid artery only a few millimetres from the point at which the latter penetrates the thyroid gland. In fig 3 also the inferior glandule a centimetre or more below the inferior pole of the thyroid gland might easily be deprived of its blood supply if its artery were not recognized in the course of the operation. There is room in this instance for the application of 2 ordinary artery clamps distal to the point of origin of the parathyroid arteriole but it should be observed that a nicely injected carefully dissected specimen makes plain conditions which in the course of an operation might be overlooked. The remaining glandules of the illustrations might with care escape destruction for their arterioles are very short and arise in the main from the anastomotic channel or quite near to this vessel.

The term *subcapsular* expresses the operation of ultra ligation very well it seems to me and I find it exceedingly convenient. It may be objected that there is normally no demonstrable capsule underneath or in the plane of the blood vessels of the thyroid gland but the term proposed by Mayo is nevertheless not confusing and will not easily be relinquished. As a matter of fact there is not infrequently in cases of goitre an intimate capsule enmeshing the vessels which can not only be seen during the dissection but demonstrated thereafter.

*The Operation of Ultra ligation in Exophthalmic Goitre*  
—The operation of ultra ligation or ligation beyond the origin of the parathyroid arterioles is quite simple if properly performed but may prove very difficult if not. The skin incision is usually made to correspond with one of the transverse lines of the neck its length depending upon the size of the goitre.

and upon the height of the superior pole of the thyroid For a better cosmetic effect, in the case of women, we often determine the precise line for the incision with the patient in a sitting posture, consulting her as to the fall of the necklaces which she wears with evening dress If the line is prescribed in the recumbent position the scar may fall too low The platysma muscle, carefully reflected upwards in the skin flap, may be divided at a slightly higher level than the skin In the dissection of this flap and indeed throughout the operation the injury to veins should be avoided as studiously as possible A vertical, mid-line incision through the fascia is carried only deep enough to enable one to raise the sterno-hyoid and omo-hyoid muscles It is an excellent suggestion of Chas Mayo's to divide these muscles near their hyoid insertion, and between clamps which are not removed until it becomes necessary to do so, to permit the placing of the muscle suture

It has not been my practice, however, to include in these clamps, the sterno-thyroid muscle I believe that one is less likely to stain the deep wound if the sterno-thyroid muscle is carefully divided by itself after the hyoid muscles have been reflected, and in such a manner as not to cause the rupture of the fine and easily torn vessels which one encounters in raising this thinly spread out, capsule-like muscle from the thyroid gland Moreover, one cannot reflect the omo-hyoid and sterno-hyoid muscles to so high a point if the sterno-thyroid muscle is included The latter muscle being well divided and the previously severed muscles forcibly reflected by means of the strong muscle-clamps, one may gently raise the thyroid lobe from its bed on a spatula-like knife handle carefully insinuated between the delicate blood vessels just coming into view

Contrary to the universal custom, I do not as a rule, complete at this moment the full delivery of the entire gland, for fear of soiling, but grasp very firmly between thumb and finger the superior pole and pull it forwards and towards the mid-line far enough to make the ultra-ligation of the superior thyroid vessels perfectly easy Attempts to completely dislocate the entire gland or the inferior pole in this manner at this

stage of the operation may cause the rupture of some delicate blood vessels and consequent staining of the field containing the parathyroid glandules. But if judiciously done in the manner described the superior pole may be fearlessly grasped because at this horizontal level there are no vessels behind the superior pole likely to be torn. When the superior thyroid vessels have been safely passed by the thumb or finger one may proceed with considerable roughness and without fear of hemorrhage to dislocate even the highest and deepest superior pole.

This grasp of the upper portion of the lobe putting on stretch the superior thyroid vessels must not be relinquished until released by the ultra division of the finest branches distributed to the thyroid gland in the vicinity of the superior pole. The upper end being thus liberated the delivery of the entire lobe is continued and without the tearing of the blood vessels. From this step on throughout the operation until the last vessel has been divided the thyroid lobe must be firmly drawn towards the opposite side alternate relaxation and compression and undue pressure on the trachea being carefully avoided. From above downwards and from before backwards the vessels as they bind or as they present must be clamped and divided at their point of entrance into the gland as far peripherally as possible.

Except in the case of the larger branches it is usually unnecessary to clamp the distal end of the cut vessel hemorrhage from the gland side being prevented by the pressure exerted on the thyroid lobe by the unremitting traction towards the opposite side of the neck. By this method the recurrent laryngeal nerve usually seen is little endangered. In the course of the liberation of the lobe the nerve may be dragged well to the front of the trachea of the right nerve this is particularly true. When in the immediate neighborhood of this nerve at what might erroneously be termed the hilus of the thyroid lobe one plunges the sharp pointed clamps into the thyroid gland seizing the binding vessels after they have disappeared from view in its substance. When the habit is well

acquired little if any time is lost by practicing the clean, bloodless method of operating for goitre. The operation can be carefully performed in about the time required for its detailed description. For the removal of a thyroid lobe in a moderately difficult case of exophthalmic goitre, ten minutes is ample time if the experienced, skillful operator is well assisted.

I am not convinced that very light general anæsthesia with ether skillfully given by an expert anæsthetist for only fifteen or twenty minutes is less safe, even in the gravest cases, than local anæsthesia plus the prolonged operative period and its attendant nerve strain. In operations for exophthalmic goitre the general anæsthesia should be administered only by an expert.

A nurse trained in the præ- and post-operative care of cases of Graves' disease should be in charge, and the patient should have a private, quiet room. We have knowledge of no analogous disease, and of no toxæmia comparable to that which follows operation upon people afflicted with hyperthyroidism. It is therefore particularly difficult for the uninitiated to realize how critical is the condition of so many of these patients until, as a demonstration, a death has been experienced.

As so impressively pronounced by Dr Mayo at his clinic, saturation of the patient with water must be accomplished in one way or another. The surgeon must not accept excuses that water could not be given by mouth because it hurt the patient to swallow, and not by the intestine because the guttatum injections were expelled, unless the patient is uncontrollable, in such event prompt resort to subcutaneous infusion must be had.

*Chilling or Freezing the Neck Before and After Operations for Graves' Disease*—It had not occurred to me until the end of June, a few days before leaving town for the summer, that excessive cold applied to the neck in these cases, particularly after operation, might delay the processes of repair and absorption and thus bridge over the period of greatest danger, the two or three days succeeding operation. Its employment was very imperfectly tested in three instances, but in all with beneficial results, it seemed to me, although one of the patients,

desperately ill before operation did not recover. In no instance unfortunately did we succeed with the inadequate appliances at our disposal in doing much more than slightly cool the surface of the skin. In one case 36 hours after operation the pulse which had been steadily rising until it reached 180 dropped 30 beats per minute within one and one half hours of the application of the cold. In another a good night's sleep the first in weeks seemed to be attributable to the application of cold to the neck. It is quite possible that harm rather than good might be done by ineffectually applied ice bags. They might serve as a poultice if for example swathed in protecting flannel or if negligently attended to. The danger of reaction too must be constantly borne in mind—the reaction following either a brief or a prolonged use of the cold. Therefore no time should be lost in changing the packs and ultimately the cold should gradually be withdrawn. I doubt the ability of the rubber ice bag to produce a degree of cold sufficient for the very ill cases or the non-conducting rubber should perhaps be so thin that rents would be hardly avoidable. In some cases a degree of cold low enough almost to freeze the skin might be necessary. Possibly to be considered as a method of treatment for desperately ill cases is an unclosed wound constantly irrigated with water of the desired temperature.

I am convinced that the toxæmia is not simply due to the absorption of thyroid secretion. Otherwise might not the gravest cases of exophthalmic goitre be safely treated by total excision of the thyroid gland? It is my belief that the toxæmia incident to wound healing is badly borne by the subjects of hyperthyroidism. On several occasions soon after thyroid lobectomy I have seen prompt and great improvement follow the liberation of a drachm or even a few drops of reddish serum from the wound. Moreover the typical post-operative toxæmia may it seems follow operations of other kinds upon patients afflicted with Graves disease. Absorption takes place continuously during the process of repair even in wounds which are dry and healing throughout by first intention. Thus it

seems to me quite reasonable to hope that something, perhaps much, may be accomplished by the adequate employment of cold. The entire neck fore and back and sides, and from chin to chest might be made so cold in the serious cases as to arrest for a time, more or less completely, the process of absorption and possibly of healing.

Furthermore, if absorption from the wound is, even in a measure, responsible for the toxæmia so badly borne, the area of the wound surfaces must be a factor influencing the result, and, if so, there would be in this an indication for as small a wound as feasible in certain cases. A vertical skin incision to avoid reflection of a flap might be tested and less complete division of the muscles at their attachment to the hyoid bone might suffice for the liberation, in the manner described in this paper of the superior pole. The operation of ultra-ligation might thus be effected through a hole just large enough to permit the delivery of the lateral lobe of the thyroid gland.

# TETANY PARATHYREOPRIVA \*

A CASE REPORT WITH A BRIEF DISCUSSION OF THE DISEASE AND OF THE  
PARATHYROID GLANDS

BY EUGENE H POOL M D

OF NEW YORK

Att d g S geo t th F h H p tal N w Y k I t t i S g ry i C I mb  
U i ty

THE acquisition in recent years of an anatomical knowledge of hitherto unsuspected organs the parathyroid glands has engendered much investigation as to the physiological role and pathological import of these bodies. Dependent upon such studies interest has coincidentally centered on the subtle question as to the explanation of certain nervous manifestations which attend the removal of these structures in animals. The condition thus artificially produced appears to be of the same nature as a group of symptoms which occasionally occurs in man. These symptoms were first described by Steinheim<sup>1</sup> in 1830 and the name tetany was subsequently given to them by Corvisart<sup>2</sup>. Since then the same clinical picture has been repeatedly noted in association with various conditions of widely different character. For example it has been seen to occur with severe gastro intestinal affections especially dilatation of the stomach with pregnancy and the puerperal state with some acute fevers with various nervous diseases and after removal of the thyroid gland.

The cause of its occurrence in most of these conditions is not understood. As a sequel however to thyroid operations it has been definitely ascribed to the removal of the parathyroid bodies and in consequence has been designated by Erdheim<sup>3</sup> tetania parathyreopriva.

Observation of a case which recently came under my care

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Read before the New York Acad my of Med n May 2 1907  
Through the courtesy of Prof T M Prudden and Prof J A Blake the  
work for th s paper was do e in the Pathological and Surgical Resea ch  
Laboratories of Columbia Univers ty



gave rise to an effort to collocate the clinical features and therapeutic possibilities in this variety of tetany To do this clearly it seems necessary to supplement such considerations with a review of the history of the subject and of the anatomy, development, and theories as to the physiological rôle of the parathyroid glandules

*Case Report*—The patient, a seamstress by occupation, is a Swiss, thirty-three years of age She was referred to my service at the French Hospital by Dr Fellowes Davis, in April, 1906 The significant features of her history are as follows

In 1903, she had considerable pain in the lower part of the neck and marked dyspnœa and dysphagia For some time previous to that there had been a large tumor in the region of the left lobe of the thyroid gland An operation was performed in Bern, Switzerland, and a tumor on the left side of the neck was removed This was undoubtedly the left lobe of the thyroid For one year after the operation she was relieved of her symptoms, but during the second year the dyspnœa, dysphagia and swelling returned and increased to such an extent that operation became imperative

Besides the features mentioned above there was nothing of importance in her history Though in childhood a number of operations had been performed upon her eyes, the last of which was eighteen years ago, she had always enjoyed good health and had never suffered from any nervous troubles

*Physical Examination*—The woman was thin and pale, her expression anxious, breathing labored, the sternomastoids prominent There was a slight rounded projection, about one and a half inches in diameter, just above the sternum, and a faint scar of the incision of the former operation could be seen The mass, which reached beneath the sternum, was firm and nodular and moved with the larynx on swallowing The examination was otherwise negative

On March 3, 1906, I operated under ether anæsthesia and exposed the thyroid by a curved incision In the region of the isthmus there was a round, smooth mass, about two and one-half inches in diameter, which was to a great extent bound down by cicatricial tissue, it extended downward behind the sternum and

compressed the trachea. The left lobe of the thyroid was absent. Before any tissue was removed the right lobe was thoroughly exposed and found to be of normal size, appearance and consistency. Accordingly the thyroid gland was clamped at the junction of the isthmus and the right lobe and cut across as close to the tumor as possible. Before doing this it was found necessary to ligate the inferior thyroid artery which ran close to the tumor. The whole of the right lobe except a small part which lay close to the isthmus was left. The wound was closed with drainage.

*Postoperative Course*—The healing of the wound was uneventful. On the fourth day after operation tetanic contractures occurred in both hands which assumed an attitude similar to that produced by stimulation of the ulnar nerve, an attitude sometimes called the accoucheur's hand, since it is the same as the position taken for making a vaginal examination. Throughout the disease this was the usual contraction of the hands. The spasm was accompanied by cramp-like pains in the hands and occasional twitching of the facial muscle, with some neuralgic pains in the right side of the face. This condition was present whenever the patient was seen during the next twenty-four hours, when cramps in the feet and calves occurred together with forcible plantar flexion of both feet which lasted for about five minutes.

After that for about thirteen months the patient presented the typical clinical features of tetany. Of the symptoms the most conspicuous were bilateral and symmetrical contractions of the flexor muscles of the hands, wrists and feet (Figs I, II and III) as previously described, preceded and accompanied by cramp-like pains in the affected muscles. To these spasms were added at times attacks of more general contracture, occasionally with cyanosis, which necessitated the administration of chloroform, attacks of asthmatic breathing, of tetanic spasms of the muscles of the face, jaw, neck and back, slowness and thickness of speech, difficulty in swallowing, but apparently no dullness of mind. The skin and hair seemed unchanged, beyond a light growth of hair on the chin and upper lip. There was for several weeks marked edema of the left wrist and hand and redness over the knuckles of this hand. Chvostek's and Trousseau's signs were present and typical almost all of the time. Thus the facial muscles as

a rule, contracted rapidly to mechanical irritation by tapping over the facial nerve, and by steady pressure on the nerves and vessels of the arm the usual contracture of the hand was brought on in about one-half to three minutes, sometimes with distinct fibrillary twitching over the thenar eminence. In this test, cramp-like pains regularly preceded the spasm which developed gradually and not suddenly. Contractures also resulted from making the sciatic nerve tense by holding the patient in a sitting position, so that the trunk and thighs were flexed beyond a right angle, with the legs extended, or by putting the nerves of the brachial plexus on the stretch by elevating the arm above the head with the forearm extended (extreme abduction) (Figs IV and V). The contracted muscles were always board-like to the touch. Unfortunately, tests with the galvanic current were not made, but Dr J A Booth reported on February 8, that with the faradic "even mild currents brought on tetanic contractions in both upper and lower extremities, showing a decided increased electrical excitability."

The above symptoms occurred in attacks at variable intervals. During the first six weeks and the last three months of the disease, there were from one to five attacks almost every day. The duration was from several minutes to several hours. During the intervening seven months, when the patient was not in the hospital, they were much less frequent, but prevented her from working.

About five weeks ago the attacks of typical tetanic spasms gradually ceased, the other tetanic symptoms also gradually disappeared, and Chvostek's, Trousseau's, and the other two tests mentioned above, became less marked, and now elicit no response. Moreover, the electrical tests made by Dr Booth on April 23, showed only slightly increased galvanic irritability in nerves and muscles, the most marked being in the ulnar nerve ("Ca Cc > An Cc, 3 Ma").

Hysterical symptoms of various kinds have, however, become marked and are now striking. This is not surprising considering the prolonged sickness and the frequent use of hypnotics and other drugs. This condition, however, is improving under the care of Dr Booth.

As regards treatment, the following were tried: various thyroid and parathyroid preparations by mouth and hypoderm-

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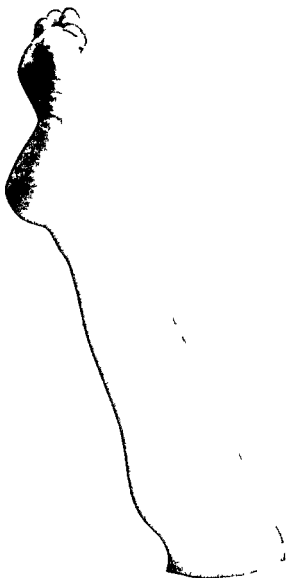


T t    i   m   h   w   g   f    f

FIG- II



Tetanic spasm showing plantar flexion of foot and toes



T i p b s i ti fm j f lf

FIG. IV A



Method of producing a tetanic spasm in feet by stretching the sciatic nerve by means of forcible flexion of trunk on thighs. Taken immediately on sitting up before occurrence of spasm





FIG. V



Method of producing tetanic spasm of hand by stretching the brachial plexus by means of forcible abduction of arm, showing accoucheur's hand

ically. The parathyroid material was supplied by Prof Vassale of Modena by Dr Beebe of New York and by Armour and Co. One saline infusion of twenty four ounces was given and five parathyroids were implanted subcutaneously. These were removed aseptically immediately after death from three accident cases put at once into ascitic fluid and implanted as soon as possible. Under general anesthesia the implantations were made into the abdominal wall and the lobe of the ear. In the latter case a deep incision was made along the lower free margin of the lobe so as to divide it into two lips. Cocaine was not used on account of the disadvantage which might result from the infiltration of the tissues. The parathyroids while in the ascitic fluid were cut so as to expose two or more raw surfaces the technique differed in this respect according to the size of the gland. The lobe of the ear seemed to present a particularly favorable site for the implantation because a perfect and permanent opposition of the implanted parathyroid and the two surfaces of the wound was readily obtained by gentle pressure produced by an appropriate dressing. All the wounds healed by primary union. The first two implantations were made on March 1 in this case the operation was finished ninety minutes after the death of the patient from whom the tissues were taken. The other three implantations were made on April 17.

The improvement which occurred about one month ago \* that is the gradual disappearance of the true symptoms of tetany was coincident with the repeated administration of Beebe's nucleo proteid in large doses by hypodermic and occurred from four to six weeks after the first implantation. No effect could be attributed to other therapeutic measures.

*Historical* †—Operations for goiter were uncommon until about 1877 but since then due largely to the impulse of Billroth and Kocher they have progressively increased in frequency. The occurrence of tetany after such operations was first recognized by Weiss \* in 1880. About three years later Kocher † and Reverdin \* called attention to the condition since known as

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\* This paper was read May 1907

† Since exhaustive histories have been published several times only a resume is given here and the reader is referred to such articles as those by Erdheim, Jeandelize and Welsh for a more detailed account.

cachexia strumipriva, and this was shown by Kocher to be a frequent sequel to complete thyroidectomy. The two diseases, tetany and cachexia strumipriva, were regarded for a considerable time simply as different phases of one condition which was supposed to be dependent upon insufficiency of the obscure function of the thyroid gland.

The above clinical contributions awakened a new interest in the study of the thyroid by animal experimentation, which had been carried on intermittently ever since the early thirties<sup>9</sup> of the last century, but with indefinite and contradictory results.

As a result, Schiff,<sup>10</sup> in 1884, clearly showed that certain animals, notably cats and dogs, regularly succumb to complete removal of the thyroid gland except in isolated cases which were explained on the supposition that the thyroid function was then carried on by aberrant or accessory thyroids.

In consequence of the dire effects which were thus noticed experimentally as well as clinically after complete thyroidectomy, it became a surgical mandate that part of the organ should be spared in goiter operations. This precept, which was fathered by Kocher,<sup>11</sup> has prevailed up to the present time and its practice accounts for the relative infrequency of postoperative tetany and cachexia strumipriva.

In the results of animal experimentation a perplexing inconsistency prevailed. Whereas total thyroidectomy in dogs, cats, and carnivora in general, was regularly followed by fatal tetany, in contrast to these animals, rabbits and other herbivora regularly survived the operation with no evidence of tetany, but with the development of the slower cachexia strumipriva.

The peculiar difference in the reactions of these two classes of animals to the removal of the thyroid gland was the crux which for a long time defied explanation and prevented further progress. Its ultimate solution, however, furnished the clew which resulted in rapid advances leading up to our present knowledge of the subject. The credit for this all-important step is due to Gley<sup>12</sup> who in 1891 called attention to the existence in the rabbit of two bodies entirely separated from the thyroid, the external parathyroids. He demonstrated that in this animal the removal of these together with the thyroid produced the same effects as complete thyroidectomy in other animals. His conclusions may be summarized as follows:

- 1 The removal of the thyroid alone (in the rabbit or dog) leaving the two external parathyroids causes no tetany
- 2 The removal of the two external parathyroids in the same species of animals also causes no tetany
- 3 The removal of the thyroid and the two parathyroids at the same time or in two stages results in tetany

He explained incorrectly the negative effect of removing the thyroid alone (1 supra) by the assumption that the parathyroids which were left acted vicariously for the thyroid. Moreover since he did not recognize the existence of the internal parathyroids the negative results following removal of the two external ones suggested to him nothing significant.

Attention should be called to the fact that Sandstroem <sup>2</sup> in 1880 eleven years before Gley's contribution had recognized the parathyroids in man and had described their gross anatomy and histology minutely and accurately. Apparently little notice was taken of his report and certainly it failed to stimulate scientific research. However the name *glandulæ parathyroideæ* which he applied to the organs has been generally adopted.

While a new theory was suggested by Moussu to the effect that the simultaneous ablation of the thyroid and parathyroids might possibly suppress two functions instead of one the first practical step towards ascribing to the parathyroids an independent potency resulted from the work of Vassale and Generali <sup>1</sup> which was published in 1896. They demonstrated that the removal of the four parathyroids the thyroid being preserved led to fatal tetany while no tetany resulted from the removal of the thyroid if the parathyroids were left. These conclusions were based upon the following striking experiments.

Ten cats total parathyroidectomy nine dead before 11th day. In all there were characteristic symptoms of tetany.

Nine dogs total parathyroidectomy all dead before the 9th day. In these animals the symptoms were analogous to those of complete thyro-parathyroidectomy. Every effort was made to exclude complications such as injuries to nerves or to the thyroid as possible causes of the fatal results.

It has been urged by numerous experimenters among whom are Biedl <sup>3</sup> Walbaum <sup>4</sup> Vassale and Generali that the intensity of tetany parathyreopriva stands roughly in inverse ratio to the number of healthy parathyroids retained by the animal. Thus

in a cat the removal of three parathyroids has been said to result generally in fatal tetany, of two, in lighter tetany, of one, in no tetany. But this rule is certainly far from absolute, for sometimes the presence of one parathyroid is sufficient to prevent the symptoms of tetany, while in other cases, two of the organs are necessary (Erdheim). The difficulty of formulating any exact deductions in regard to this phase of the subject is further increased by the fact that besides frequent variations in animals of the same species, there is a constant and marked difference in the reaction of different species to partial or complete parathyroidectomy, in respect to the rapidity of the onset and the intensity of the symptoms.

In 1903, Jeandelize, in an exhaustive treatise, reviewed and amplified the whole subject. The following summary from his work is a fair indication of the general attitude at that date.

- 1 The thyroid and parathyroids are different organs
- 2 The results of ablation of the two are not the same
- 3 Physiologically, the two organs are dependent upon one another, yet neither can assume the functions of both

In elaborating the effects of ablation of these organs he calls attention to the fact that thyroidectomy alone does not cause the grave troubles of parathyroidectomy, but instead, especially in young animals, gives rise to troubles of nutrition. The animals remain undersized, their behavior is altered and sluggish, the skin becomes thick and edematous, and the hair becomes coarse. The onset of the change is less than a month after the operation.

On the other hand, he states, parathyroidectomy produces a more rapid onset of symptoms, which are briefly, fibrillary twitchings, tremors, local or general contractions (tonic or clonic), convulsions, dyspnoea, tachycardia, ptyalism, thirst, vomiting, diarrhoea, general weakness and prostration.

He therefore concludes that as a result of insufficiency of the thyroid there occur nutritional disturbances, whereas insufficiency of the parathyroid produces acute convulsive troubles. This, he says, is proved in several species of animals and is probably true for all vertebrates.

In consequence, it was assumed that operative myxedema, which is a nutritional disturbance, is due to removal of the thyroid, and tetany, which is a convulsive trouble, to removal of the parathyroids. Under such an assumption these two con-

*ditions necessarily came to be regarded as radically different a transition from one to the other being out of the question*

Erdheim has recently by clinical and experimental observations further elaborated the evidence of the potentiality of the parathyroids. After partial or total destruction of the parathyroids in rats with the minimum of injury to the thyroid he studied the symptom complex of the resulting tetany which occurred in all the cases of total parathyroidectomy. In the animals presenting tetany by systematic serial microscopic section of all the organs of the neck he demonstrated the presence of the thyroid and absence of parathyroid and thus established the fact that the lesion in every case was purely parathyreopriva.

Although individual differences were marked in his animal tetany began as a rule several hours after operation and reached its height usually in the first twenty four hours in the form of epileptiform convulsions. The condition then passed into a chronic state. In the study of the symptom complex due to parathyroidectomy exclusively besides demonstrating the regular occurrence of a typical tetany Erdheim also verified the occurrence of regular nutritive changes notably very excessive growth of the lower incisors. But the association with tetany of some trophic disturbances resembling those observed in cachexia strumpriva was not regarded as a justification for the conclusion that the two conditions are of identical origin.

Erdheim's studies of three cases of human tetany are remarkably significant. In each a partial thyroidectomy was performed for goiter. Unquestionably tetany developed shortly after the operation and death followed on the 13<sup>st</sup>, 5<sup>th</sup> and 17<sup>th</sup> days. Very complete serial microscopic sections of the neck organs showed in each case the presence of considerable well preserved thyroid tissue whereas in the first case none of the four usual parathyroids were found and only two very small accessory parathyroids which lay in the thymus. In the second case only one parathyroid was recognizable and that was practically entirely necrotic. In the third case not one of the regular four nor even an accessory organ was found.

A review of all cases of tetany which have been reported as occurring after strumectomy would prove unfruitful. Only a small number are of practical interest in this connection namely partial thyroidectomies which permit definite conclusions as to

the involvement of the parathyroids in the extirpation Pineles<sup>18</sup> compiled thirteen cases of this kind. Of these, there were six cases of extirpation of both lateral lobes, four cases of preservation of the upper portion of one lateral lobe, three cases of extirpation of a lateral lobe with the isthmus. As a result he pointed out that tetany follows partial thyroidectomy most frequently in those cases where extirpation of, or injury to, the parathyroids is most likely to occur, and consequently that tetany is most likely to follow those cases in which only the isthmus or upper part of a lateral lobe is left.

It seems then to have been proven by a long series of careful experiments, strengthened recently by the significant findings of Erdheim and Pineles in man, that tetany following goiter operations is due to the removal of the parathyroid glandules. Nevertheless, this attributes such marked potency to these little organs that, not unnaturally, there are still some observers who are skeptical as to the truth of the assumption, and among them are competent men who have weighed carefully all sides of the question. The explanation of this divergence of opinion lies in the fact that besides such apparently conclusive results as those described above, there have been numerous other investigations, the outcomes of which have not been uniform or positive. For example, even recently, Vincent and Jolly<sup>19</sup> have found that "removal of all four parathyroids was not necessarily fatal," and they "were unable to confirm some other statements which are very commonly accepted" on this subject. Further, Vincent wrote that "the question of the extreme importance of the parathyroids can not yet be considered as settled." Moreover, Caro,<sup>20</sup> although familiar with the extensive work of Pineles, has quite recently expressed the opinion that there is no reason for abandoning the former interpretation that tetany is an acute manifestation of the loss of thyroid (not parathyroid) substance. Animal experimentation has failed to convince him of the importance of the parathyroids. He states, moreover, that in goiter cases, the parathyroids are sometimes found to consist simply of atrophic and barely distinguishable lamellæ closely applied to the capsule, and he arrives at the conclusion that in Erdheim's three cases the dependence of the tetany upon the suppression of the parathyroids is by no means proven. However, it is fair to state that almost all observers at the present time regard tetany

following goiter operations as the direct result of the absence of the parathyroid function

CASES OF TETANY PARATHYREOPRIVA FOLLOWING PARTIAL THYROIDECTOMY  
COLLECTED BY PINELES WITH LATER ADDITIONS

- Szuman C nt f Chir 1884 p 79  
 Hoffmann J Deut. Arch f klin Med Bd. xl 1888 p 80  
 Turett Riforma Med ca 1891  
 v Czychla Wen klin Woch 190 p 53  
 M dden F C Lanc t 1903 vol 1 p 1729  
 Westph l B rl klin Woch 1901 p 849.  
 Meinert Arch f Gynaekologie Bd 1898 p 446  
 Kummer Rev med d la Suisse Rom 1898  
 Schilling Munch med Wo h 1899 p 250  
 Bruns Beit z klin Chr Bd x 1896 p 69  
 v E sel berg Wen klin Woch 189 p 81  
     Beit klin Chr Fet t rift 189 p 380  
     b d p 37  
     bid p 378  
     ibid p 381  
     b d p 383  
     bid p 384  
     W n klin Wo h 1906 p 80  
 Richel (2 case ) Munch m d Woch 190 p 01  
 Friedheim Cent f Clir Bd xxx No 30 B lager 1905 p 30  
 E dheim (3 cases) Mitteil d Gr n geb d Med u Chir Bd  
 vii 1906  
 Monnie E Bet kl Ch Bd li 1907 p 63

ANATOMY OF THE PARATHYROID BODIES IN THE HUMAN  
SUBJECT \*

In man parathyroid bodies are constantly present the number varies Exact enumeration in an individual case is difficult for two reasons first their small size and variable position render it an easy matter to overlook one or more of the bodies second various tissues may be mistaken for a parathyroid especially lymph nodes hemolymph nodes accessory thyroids thymus rests and fat Microscopic examination alone can exclude these tissues

Berkeley <sup>1</sup> as a result of about one hundred and twenty five autopsies concluded that while the number four seems

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\* For technique of dissection cf Berkeley<sup>21</sup> or Petersen.<sup>22</sup>



to satisfy the demands of anatomical symmetry, this number is often diminished by one or more" and occasionally increased. He apparently found on an average about two and a half parathyroids per person. Most observers have reported smaller averages, but Verebely<sup>22</sup> found four parathyroids 108 times in 138 autopsies. In our own dissections,<sup>†</sup> the last sixteen resulted in an average of 2.9 per person. In all of these one-half of every suspected tissue was removed and examined microscopically. The other half was left in situ for further reference, a lettered drawing of each specimen facilitated identification of the sections.

The occurrence of the glands in pairs may properly be considered the typical arrangement, a superior and an inferior body being present on each side. Judging from our own dissections and the descriptions of Verebely, Thompson<sup>24</sup> and earlier writers, the following seem to be the most frequent situations, and correspond closely to the drawing (Fig. VI).

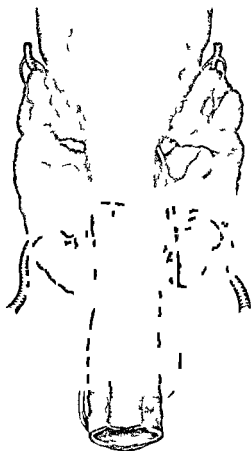
The superior, the more constant in position, lies close to the thyroid in the middle third of its posterior border, approximately on the level of the lower border of the cricoid cartilage (Welsh<sup>5</sup>). It lies in a plane posterior and external to the terminal branches of the inferior thyroid artery and recurrent laryngeal nerve. On the left side the gland is frequently further posterior than on the right.

The inferior, often intimately associated with the thymus (Verebely), lies at or below the inferior pole of the thyroid or on the posterior aspect of the lower third, in which case it is frequently found anterior to the recurrent laryngeal nerve and inferior thyroid artery, close to the thyroid gland at the entrance of the lower twigs of the artery.

Variations from these anatomical positions are frequent. The most striking which we have found was the presence of a large parathyroid on the anterior surface of the isthmus. As common variations in position may be mentioned the tip of the lateral lobe of the thyroid or even above this, anywhere on or

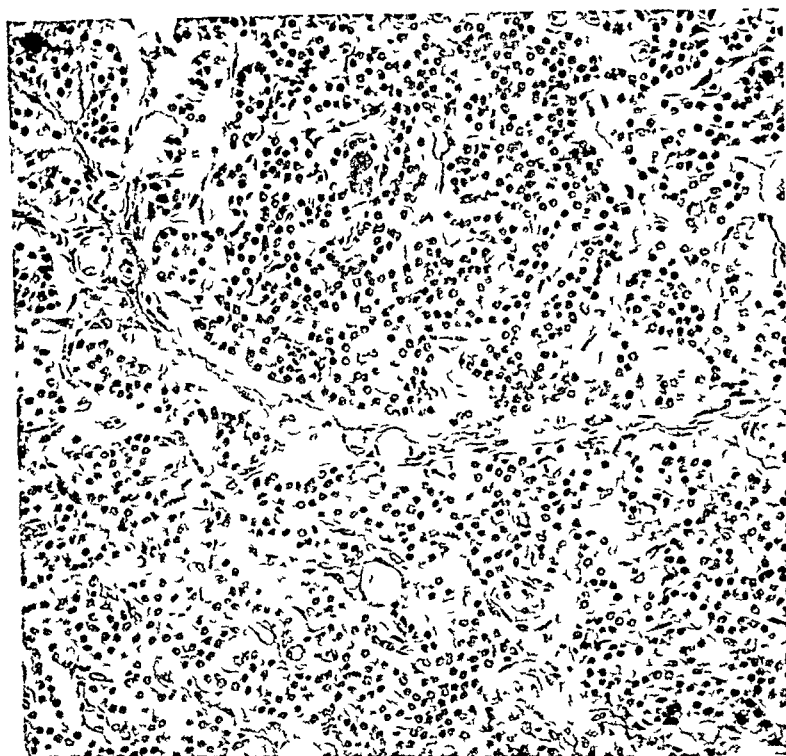
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<sup>†</sup> These were done with the aid of G. C. Whitney, of the Third Year Class of the College of Physicians and Surgeons.



Th pa thy d bod es h i h h h y m m f d

FIG VIII



Distribution of cells in strands and groups Colloid is present in several places A

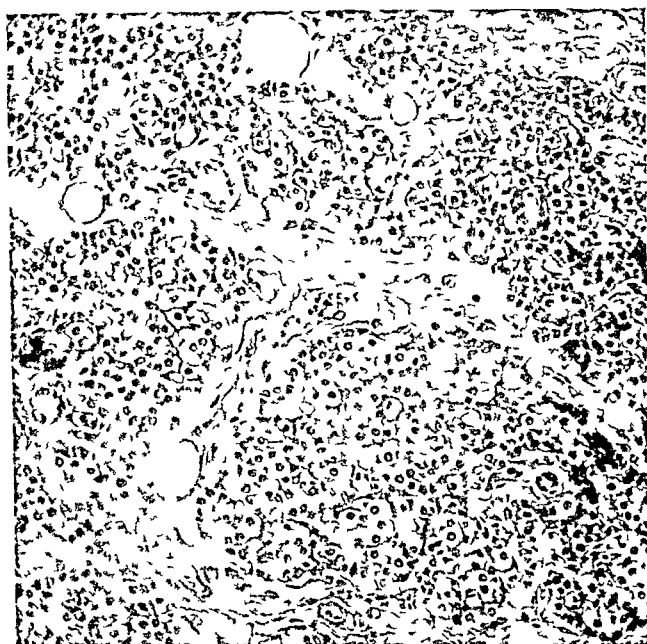
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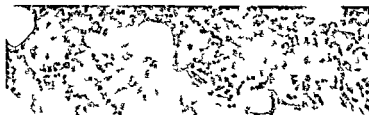
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11 m

FIG. 1

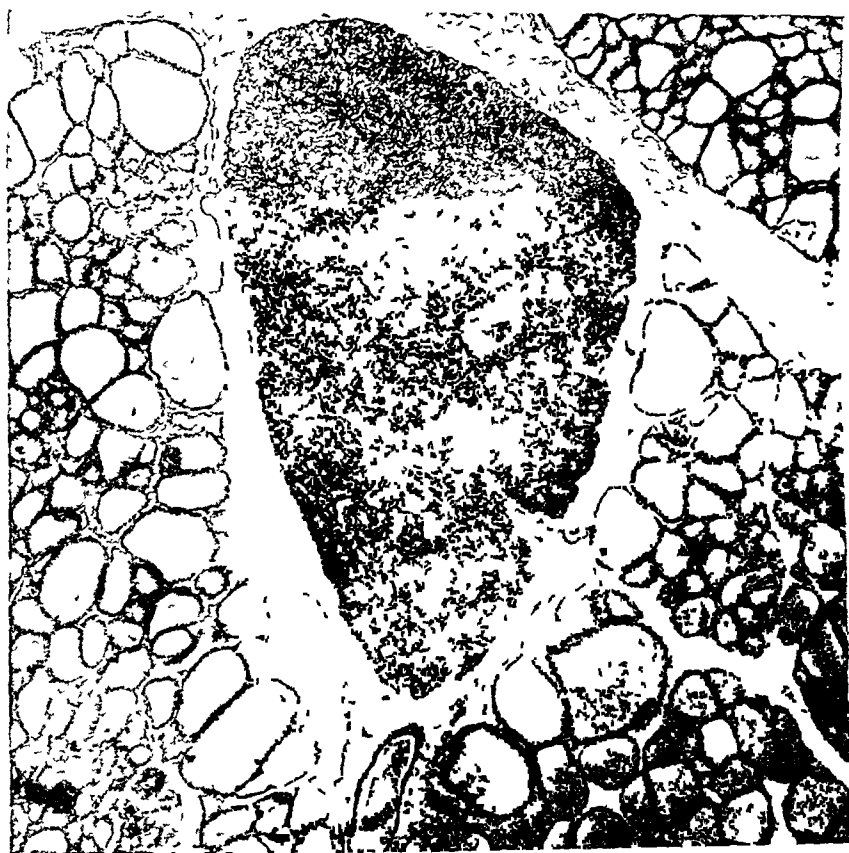


Principal cells



Mas ( pl 1 11

FIG XII



Parathyroid of a dog

near the posterior border. These sites however do not limit the possibilities.

Accessory organs that is small accumulations of characteristic parathyroid cells have been found not infrequently below the thyroid especially within the thymus\*.

While in most cases the glands lie embedded in fat outside of the thyroid the position of one or more may be beneath its capsule but only very rarely embedded in its substance (Verebely). Each parathyroid is completely invested with a thin fibrous capsule under which a fine anastomosis can be seen. The size of the organ varies from about 3 mm to 15 mm the average being about  $6 \times 4 \times 2$  mm (Berkeley). The bodies are usually somewhat flattened and may be of various shapes but especially round oval or reniform. Occasionally a parathyroid is subdivided into two distinct parts. The color is a brown red or a reddish yellow. Often a glandule of regular outline presents a relatively large segment of fat. This is said to occur most often in advanced age.

The blood supply of the gland is derived from branches of the superior and inferior thyroid arteries particularly the former.

Histologically (Figs VIII-XII) the organ consists of a mass of cells invested with a thin fibrous capsule from which occasional irregular processes reach inward. The gland has a reticular stroma and is as a rule strikingly vascular presenting numerous large capillaries. Frequently fat is present both as an infiltration of the stroma and as a cellular metamorphosis<sup>28</sup>. The amount is subject to very wide differences and to this is largely due the variable color of the gland. Especially in advanced life a considerable part of the gland may be replaced by fat. The distribution of the cells varies greatly. They may form an extensive cell mass with only occasional interruptions by vessels and fibrous strands or they may be broken up by vessels and connective tissue so as to form clusters of lobules or net like trabeculae. Occasionally there is an alveolar group-

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\*They have also recently been described as occurring within the thyroid (Getzowa\*)



ing of cuboidal or somewhat cylindrical cells with basal nuclei. These at times surround a lumen filled with colloid, which is said by Richardson<sup>27</sup> to be retrograde or degenerative material, and not a higher stage of glandular development. Intracellular and intercellular accumulations of colloid also occasionally occur, while glycogen has been demonstrated as a cell inclusion (Petersen).

The cell grouping rarely comprises one alone of the above structural types, as a rule there is a combination of the varieties, the divergencies presented by individual glands in this respect being very wide. The cells themselves are mostly polygonal, sometimes round or cuboidal. They are classified by Welsh<sup>5</sup> as of two distinct types.

*Type I* "Principal cells" These are by far the more numerous. The cell body is relatively small and is either feebly stained with basic aniline dyes, or is clear and colorless. The cells then seemingly consist only of nucleus and membrane which takes a deep eosin stain. We have noted that some of the cells which belong to this group sometimes present an irregular stained peripheral zone and a clear cytoplasm immediately around the nucleus. The variations in the relative width of the clear and the stained zones suggest that under certain conditions the cytoplasm of the clear cells takes on a stain which acts first near the periphery and then progressively toward the nucleus until the whole cell body may be stained.\* The nucleus with open chromatin network is large, pale, often ovoid, and frequently, eccentrically situated. The distribution of these cells conforms to the general description already given.

*Type II* "Oxyphile cells" These have a relatively large, finely granular body, the granules of which stain deeply with eosin. The nucleus with closely arranged chromatin is small, and round, and takes a deep stain. Compact masses of these cells frequently occur, especially immediately beneath the capsule. They are also distributed as anastomosing columns and as single cells or small groups scattered among the principal cells, lastly, in rare cases, acini with colloid are met with.

Petersen<sup>23</sup> adds a third type. His Types I and III are respectively the same as Types I and II of Welsh. He describes Type II as not characteristic. The cells are smaller than in I, there is no sharp boundary to the cells, of which the granular protoplasmic body stains deeply with eosin, in places

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\* Since the above was written, Getzowa has reported similar findings and has gone so far as to subdivide the group into "wasserhelle" or clear, and "rosarote" or pink cells.

the cells are so small that nothing is seen but a complex of deeply stained nuclei. He states that all possible intervening forms occur between Types I and II and suggests that the organ is a glandular one and that Type I represents the functioning condition.

In studying parathyroids microscopically the three varieties of cells can easily be recognized. Further careful exam-

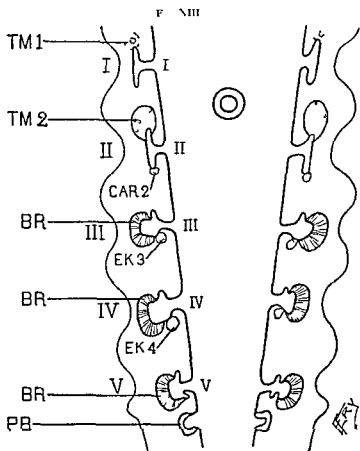


Diagram of the parathyroid gland (M. diff. d. from M.)

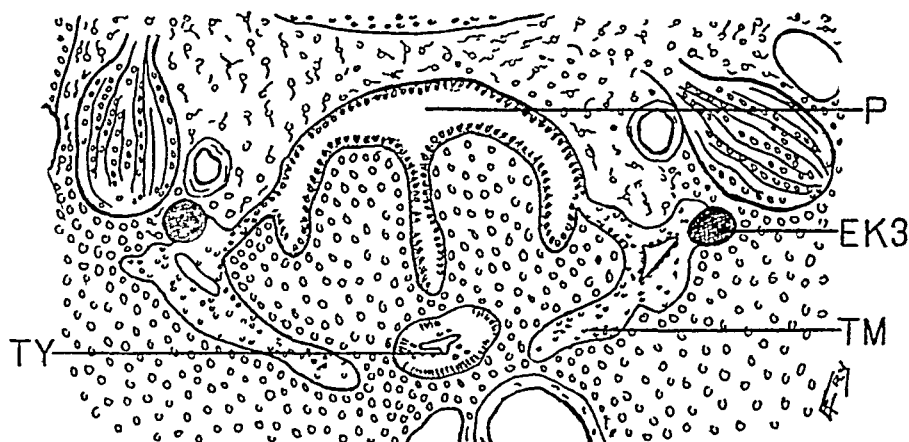
ination enables the observer to trace the cells in some glands from the clear ones of Type I through the above described granular condition to the small granular cells of Type II of Petersen. With more difficulty gradations also may be traced

from the latter to the large granular cells (Type II, Welsh, Type III, Petersen), where these occur singly or in small groups, but the line of demarcation at the edge of the large groups is sharply drawn. Following the analogy of the salivary and other glands the question naturally suggests itself as to whether the granular cells are not the functioning and the clear cells the resting condition of the cells †

#### EMBRYOLOGY

It is necessary to touch briefly on the embryology of the parathyroids in order to establish their developmental independence of the thyroid

FIG XIV



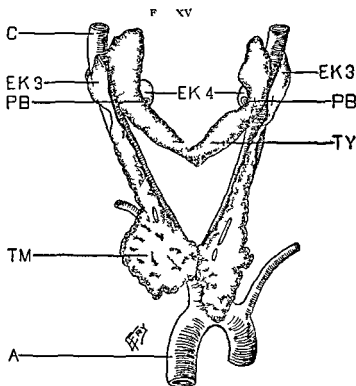
Transverse section of embryo of echidna, level of third branchial cleft (Modified from Maurer)

The parathyroids or "epithelial bodies" (Kohn<sup>28</sup>) are branchial cleft derivatives. In man and most mammals they develop from the third and fourth branchial clefts of each side as masses of compact epithelial cells which are in no way connected with the thyroid (Fig XIV). Two on each side is the usual arrangement, though anomalies are not infrequent.

The third pharyngeal pouch with its derivatives, the thymus and the parathyroid body, becomes separated from the

† Getzowa<sup>22</sup> has recently expressed a similar view

pharynx This parathyroid body later comes into relation with the thyroid from the side and forms the inferior parathyroid or outer epithelial body (Kohn) (Figs XV and XVI Ek 3) When the fourth pouch becomes separated its derivatives the parathyroid thymus and post branchial body are primarily connected The post branchial body and the superior parathyroid or inner epithelial body (Fig XV and



Embry ( rabbit 6 mm l g (Modified from V d )

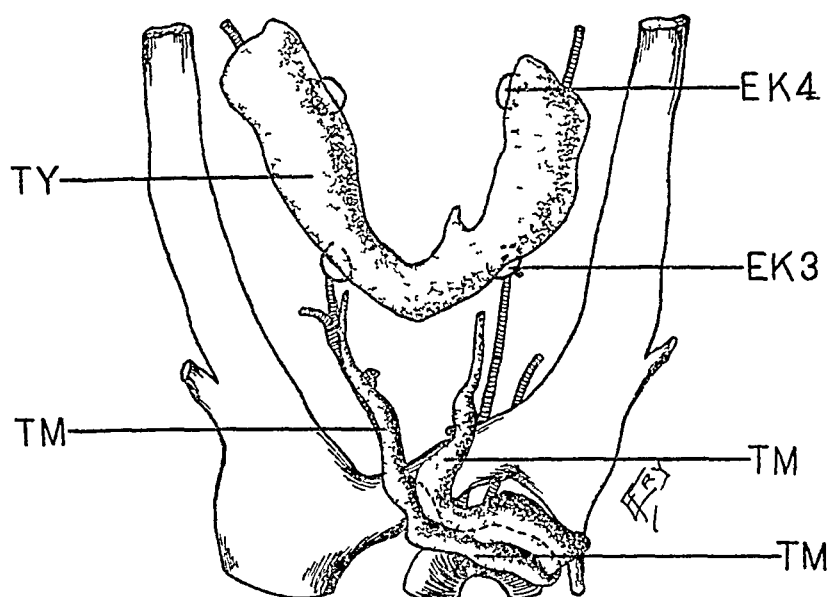
XVI Ek 4) become annexed to the thyroid only secondarily in the course of development There is no proof of the assumption that the parathyroids are embryonal thyroid tissue and that they may under certain conditions develop into the mature tissue of that gland The relation of these bodies to the thyroid must on the basis of our present knowledge be regarded as purely topographical \*

\* Sophia Getzowa in a very elaborate article has recently advanced

## PHYSIOLOGICAL AND PATHOLOGICAL CONSIDERATIONS

If we accept the view that the parathyroids have a function in part or altogether independent of the thyroid, there are certain hypotheses and experimental results which from a physiological standpoint are suggestive and offer a basis for further investigation

FIG \VI



Human embryo 29 m m long (Modified from Verdun )

|       |                             |       |                                 |
|-------|-----------------------------|-------|---------------------------------|
| TY    | Thyroid                     | I V   | Branchial clefts, outer aspect  |
| TM    | Thymus                      | I'-V' | Branchial clefts, inner aspects |
| Car 2 | Carotid gland               | P     | Pharynx                         |
| EK 3  | Parathyroid of third cleft  | A     | Aorta                           |
| EK 4  | Parathyroid of fourth cleft | C     | Carotid                         |
| PB    | Post branchial body         | BR    | Branchial rests                 |

The hypothesis has been advanced by MacCallum,<sup>29</sup> Frommer,<sup>30</sup> Lundborg,<sup>31</sup> and others, that the parathyroids have an antitoxic action, the suppression of which results in the tetany reaction. By this hypothesis tetany parathyreopriva would be

the hypothesis that there may be an independent third parathyroid developed from the fifth branchial cleft. In this way she would explain the occasional occurrence of parathyroid tissue within the thyroid gland in cases in which the extrathyroidal superior parathyroids are also present

explained as an auto intoxication. In support of this view is the fact brought out by MacCallum that the disease in animals is temporarily relieved by bleeding and injection of salt solution into the veins; this he thought demonstrated the presence of a circulating toxin. The transmission of tetany to a healthy animal by transfusion of blood from one affected with the disease, although claimed by some as possible, can not be accepted as proved.

If the above hypothesis is accepted, and it seems the most plausible one yet advanced, it may fairly be assumed that whereas the thyroid secretes a substance which is necessary for metabolism, the chief function of the parathyroid is to prevent the action of certain toxic substances regularly present in the circulation.

Attempts to ascribe the etiology of all forms of tetany and even of certain allied diseases, as paralysis agitans, to an imperfect functional activity of the parathyroid glands, have not yet been successful. Nevertheless Pineles<sup>32</sup> assumes the existence of a common etiology for all forms of tetany. He inclines to the belief that further research will trace the unopposed action of the tetanic toxin in all forms of tetany to a depressed functional state of the parathyroids. Chvostek<sup>33</sup> also expresses the view that all varieties of tetany are dependent upon the parathyroid bodies. His observations of tetany apart from that following goiter operations led him to believe that the essential feature in the etiology is a functional disturbance of the parathyroid glands so that they are unable to adapt themselves to various changes. It is due to this susceptible condition, he thinks, that menstruation, pregnancy, infectious diseases, etc., are prone to produce the tetany reaction.

The variety of food and the state of fullness or emptiness of the intestinal tract are said to have but little influence on the course of tetany (MacCallum)<sup>34</sup>. Whether the iodine contained in the organ plays an important role is not known.

In regard to the nervous phenomena of tetany, no conclusive explanation has as yet been offered.

*Symptoms*—According to v. Frankl-Hochwart<sup>35</sup> with

whose descriptions of the disease the following account conforms, tetany parathyreopriva is characterized by certain very striking symptoms which render it practically unmistakable. The most conspicuous of these are intermittent tonic spasms of the voluntary muscles, those of the extremities being most affected. A salient feature is the exclusive involvement of the flexor groups of muscles. Intercurrent contractures of the facial muscles are relatively rare, and the muscles of the chest, back and abdomen participate in exceptional cases only. The tetanic spasms are usually preceded by certain prodromata which persist for a variable period before the onset of the attack. These include headache, sensations of weakness or prostration, more or less rigidity of the limbs, radiating pains and clonic twitchings. The contractions usually begin in the hands, and subsequently involve the feet, less often the feet are affected coincidently or independently. The spasms are almost always symmetrical and bilateral. As a rule, two or more of the fingers are flexed and the thumbs are forcibly adducted, sometimes tightly clasped by the contracting digits. In fifty per cent of the cases, the wrist also becomes flexed, while flexion of the forearm with adduction of the arm to the trunk occurs infrequently. Exceptionally, the fingers are held wide apart, the terminal phalanges alone being flexed. The feet, when involved, take the position of *pes equinus* or *equinovarus*, as a result of contraction of the muscles of the calf. In the contractions of tetany, the affected muscles become very hard to the touch and oppose a powerful resistance to attempts at passive relaxation. Should this prove successful the tetanic attitude is at once resumed when the traction diminishes. Fibrillary twitchings are sometimes visible in the contracted muscles. The duration of an attack may not exceed a few minutes, or the attack may last for a number of hours, but it rarely persists as long as forty-eight hours. The termination of a tetanic spasm is frequently preceded by symptoms resembling those observed at the onset.

While there may be a free interval of days or weeks between the attacks, unfortunately this is far from being the rule

There are generally several attacks in the course of the day whereas the patient's rest at night is unbroken. In the severest cases one attack follows another with alarming rapidity.

Trousseau assumes three distinct degrees of tetany based upon the distribution of the spasms: first a mild form affecting the peripheral muscles only; some of these attacks may even be limited to the hands; second a moderate form with involvement of the facial, abdominal and trunk muscles; third a severe form extending to the involuntary muscles.

Besides the attacks of spasms there are other manifestations of the disease. Certain disturbances of sensation are regularly present, especially pain, which is a constant concomitant of the spasms. Hyperesthesia, paresthesia or anaesthesia may also be noted. Temporary redness and edema are not infrequently observed over the joints. Trophic and secretory anomalies, such as sweating, loss of hair and changes in the nails, are not very uncommon.

Of particular significance as bearing on the diagnosis are the tests of Chvostek, Trousseau and Erb. In two-thirds of all cases of tetany it is possible to demonstrate Trousseau's phenomenon. The symptom consists in the occurrence of a tetanic spasm in a limb as the result of compression of its main vessels and nerve trunks. By the animal experiments of Frankl, Hochwart and Kashida, this phenomenon has been shown to depend upon stimulation of the nerves.

Chvostek pointed out the facial phenomenon which can be elicited in tetanic patients by gently tapping over the area of distribution of the facial nerve. The resulting short twitchings are known as Chvostek's symptom, which is especially valuable by reason of the simple technique required for its demonstration.

Erb called attention to the fact that electric hyperexcitability of the motor nerves is regularly present in these cases. There is a marked increase of galvanic irritability, especially in the ulnar nerves, whereas an increased reaction to the faradic current is far less constant. The value of the two tests dependent upon stretching the nerves of the



brachial plexus and the sciatic nerve, which were so striking in our case, can not be estimated properly until repeated trials have been made in further cases

The tendon reflexes are normal or increased. A certain number of cases, too numerous to be interpreted as an accidental coincidence, present a combination of tetany with typical epileptic seizures. These symptoms have sometimes been observed after thyroidectomy in individuals previously free from nervous symptoms, and a possible connection between epilepsy and tetany has accordingly been suggested. Certain authors also include among the symptoms of tetany the hysterical attacks which are occasionally present (cf Frankl Hochwart)

The course of tetany following thyroidectomy has been divided by Frankl Hochwart into three classes: first, cases characterized by onset soon after operation, severe course, and fatal outcome; second, cases in which the symptoms appear soon after the operation but subside after a variable time and are followed by recovery; third, cases in which the patients live and symptoms of myxedema become associated in variable degree with those of tetany.

*Diagnosis*—In regard to the diagnosis of tetany, Frankl Hochwart states that it is a simple matter and that there is only one condition, namely, hysteria, which may give rise to symptoms that are strikingly suggestive of those of tetany. But, he says, it will not do on that account to designate tetany or certain of its varieties as a manifestation of hysteria, for there are many features of tetany which can scarcely have anything in common with hysteria. Although he believes imitation of tetany to be uncommon, one can not overlook the possibility of imitation of the symptoms particularly after the tetany has run its course. Such was Minor's<sup>36</sup> explanation of a case observed by him.

Tetany, according to Frankl Hochwart, is at once suggested in the case of individuals who have recently undergone an extirpation of the thyroid gland. He emphasizes particularly the importance of Trousseau's sign as a differentiating test. It is unquestionable that responses can be obtained by

pressure in hysteria and other conditions which may be readily mistaken for Trousseau's sign (Curschmann<sup>37</sup>) But in a given case Frankl Hochwart says the differential diagnosis should be based upon the sudden appearance of spasms as the result of pressure in hysteria whereas in tetany tonic rigidity is very gradually induced by pressure He goes so far as to say that in a considerable number of hysterical patients he never succeeded in producing anything akin to Trousseau's phenomenon

The marked galvanic hyperexcitability of the motor nerve and especially of the ulnar nerves is an important feature for diagnosis But whether its absence should be regarded as conclusive in ruling out the disease is questionable Weiss<sup>38</sup> reported one case among thirteen cases of tetany examined by him in which there was no hyperexcitability Frankl Hochwart says that he observed a similar case but did not regard it as conclusive because it happened that the ulnar nerve was not tested in this particular patient Recently he says a woman came under his observation who he knew had suffered for years from tetany strumpriva and had generally presented a very marked galvanic hyperexcitability of the nerves This time it was not distinctly increased and at best could be designated as rather high

*Treatment*—Much experimental work has been done on this important phase of the subject There is however considerable confliction in the results reported This is not surprising since the course of the disease in animals is so irregular as to render it extremely difficult to estimate the effect of treatment Even without treatment some animals which present profound manifestations of tetany a few hours after operation pass after one or more such attacks into a chronic condition and live for days in contrast to others in which the first attack proves fatal

Attention was naturally first directed to the administration by mouth of thyroid and parathyroid glands and their products Hoffmann<sup>39</sup> Levy Dorn<sup>40</sup> and Westphal<sup>41</sup> and many others have reported improvement of the symptoms of

tetany in man after feeding thyroid gland or its derivatives. Most observers, however, disclaim any favorable results with exclusive thyroid therapy, and Loewenthal and Wiebrecht<sup>42</sup> ascribed the apparent effects of thyroid feeding to the admixture of parathyroids. Yet it does not appear to have been proven that either mixed thyroid and parathyroid or even pure parathyroid feeding can control the disease in animals. According to Biedl<sup>16</sup> (p. 321) "the sequellæ of parathyroidectomy cannot be prevented by parathyroid feeding." MacCallum<sup>34</sup> reported benefit as the result of intravenous injections in parathyroidectomized dogs of very large amounts of prepared parathyroids of dogs. Administered to animals in subcutaneous injections, thyroid gland derivatives have proved inefficient, whereas parathyroid products are said to have met with some success at the hands of Beebe,<sup>43</sup> and others. With the nucleo-proteid Beebe claims that amelioration or disappearance of the symptoms is almost constant.

Uncertainty prevails as to the effect of transplantation. Transplanted parathyroid tissue survived in the animal experiments of Cüstiana,<sup>44</sup> and became atrophied after a variable time in the experience of Camus,<sup>45</sup> whereas Lusena<sup>46</sup> refers to cases in which the subcutaneous transplantation of parathyroid seemed to have a decidedly favorable effect.

Of the applicability of the above methods in man little has been demonstrated. Here the effects of treatment are difficult to estimate because of the impressionable character of the patients and the frequent modification of the disease by hysterical manifestations. Some successes with thyroid feeding have been reported, as stated above, and MacCallum,<sup>47</sup> Marinesco,<sup>48</sup> Loewenthal and Wiebrecht<sup>42</sup> and others have reported improvement following the administration of parathyroid material by mouth. Yet the results in animals apparently have demonstrated that in the treatment of tetany by parathyroid therapy, subcutaneous administration is the means which offers the best prospect of controlling the disease. Beebe's nucleo-proteid at present appears to be the most efficient product for this purpose.

There is no record before the present of attempts to establish a permanent cure in man by parathyroid transplantation

*Transplantation*—The important part which tissue transplantation now occupies in the experimental work which is being done in tetany and its peculiar significance as a possible therapeutic agent in this disease warrants a brief review of the main principles of the subject

Parenchymatous organs in part or in entirety seem to have been successfully transplanted in a number of cases between animals of the same species and even between human beings. But the transplantation of such tissue from an animal to man or experimentally between animals of different species has almost \* uniformly failed presumably by reason of some cytolytic property of the fluids of an animal towards tissues of another species. The implanted tissues certainly do not abide permanently and temporary functional effects may fairly be assumed to result from absorption of the implanted tissue and its juices

The behavior of individual glandular organs when transplanted is extremely variable. According to Payr<sup>50</sup> those organs which have an internal secretion seem to be far better adapted to transplantation than those with an external secretion

Of parenchymatous transplantation that of the thyroid gland is by far the most important. The original experimental transplantations of this organ in animals were done by Schiff<sup>51</sup> and the first attempt in man was made by Kocher in a case of cachexia strumipriva (1883). The functional results in both instances were transient only. It was tried by Bircher<sup>52</sup> and others for myxedema but with similar results

The first attempts which seem to have been successful in respect to the life and function of the transplanted thyroid tissue were those of v. Eiselsberg<sup>53</sup> and Cristiani<sup>54</sup>. But whether this functional activity is only temporary as urged by Ender

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Christiani<sup>54</sup> reported some success in the transplantation of thyroid tissue from one animal to another of a different kind.

len,<sup>55</sup> is still problematic. However, Payr<sup>50</sup> has recently reported striking and suggestive results in animals and in the human subject. He transplanted thyroid tissue from the mother into the spleen of a six year old child who was suffering from congenital myxedema. Marked improvement is said to have resulted, and to have persisted up to the time of publication eight and a half months after the operation.

Among other tissues of which successful transplantations in animals have been reported are the ovary, mammary gland, adrenal body, and kidney, in the human subject, besides the thyroid, the ovary may be mentioned.

Among Carrell's remarkable successes in transplantations of the kidney are some in which he demonstrated that the viability of the organ was preserved during an interval of two hours between its excision and its implantation. When an interval thus elapses it has been shown by Cristiani that the viability is best retained by preserving the tissue in serum from the same species of animal or in inactivated serum of an animal of another species, the ordinary salt solution proves toxic. Flexner found that this also applies in the case of pathological tissue.

As to the most favorable site for implantation, opinions differ. The main places to be considered are the subcutaneous tissue, extraperitoneal tissue, peritoneal cavity, omentum, and spleen. In determining the situation for election in a given case attention must be given to the freedom from serious danger which it offers and to its qualifications for supporting the life of the implanted tissue.

Looking now towards the possibility of parathyroid implantations, from general experience grafting between animals of different species would not appear promising, but for obvious reasons the question should be definitely settled on account of therapeutic possibilities. Between animals of the same species, on the other hand, some prospect of success seems offered. Payr mentions several cases in his experiments in which living parathyroid as well as thyroid tissue was found embedded in the spleen at a considerable interval after the

transplantation Moreover since his thyroid implantations were said to be functionally successful by analogy one might reasonably look for similar results with the parathyroid Finally Lusena and Cristiani seem to have obtained some functional effects in pure parathyroid transplantations

With the view of solving the therapeutic possibilities of parathyroid transplantation in man experiments were undertaken to establish the following essential questions

1 Can the parathyroid live if transplanted first between animals of different species second between animals of the same species?

2 If it lives does it functionate and if so is the function permanent?

In the first series the rabbit was adopted as the donor because of the accessibility and definiteness of the external parathyroids which were regularly employed The dog was adopted as the recipient in both series because it seemed likely that the subsequent removal of the normal parathyroids would be relatively simple and certain Experience showed that this choice was a mistake and that some other animal probably would have proved better

The spleen was taken as the site for implantation because of Payr's successes and his claims in favor of it He suggests that the spleen offers the most suitable combination of the two main factors necessary in tissue receiving an implantation namely high vascularity and richness in lymphatics

The points of interest in my experiments were as follows In one rabbit one external parathyroid was removed the otI was exposed and its size recorded no tetany resulted Eighteen days later the second external parathyroid had increased considerably in size Similar enlargement has been noticed by others and it has been suggested that it is in the nature of a compensation for the organ lost In seven rabbits both external parathyroids were removed there followed no tetany except in one animal which presented twitching of the head for about two days In three rabbits complete thyro parathyroid ectomy was performed in two tetany developed with death in

thirty and forty hours, the third died on the ninth day, but no positive signs of tetany were noticed. In four dogs complete thyro-parathyroidectomy was performed. In all, tetany of variable intensity developed with death in two to sixteen days. In four dogs complete parathyroidectomy was done, leaving the thyroid. In three fatal tetany developed, in one, questionable tetany without death.

These results simply bear out the experience of many others in regard to the effect of removing the parathyroids. The tetany developed in the dogs in spite of the fact that in all except three of the cases implantations had been made.

Parathyroids were implanted into the spleen of twelve dogs, that is, the eight mentioned above and four others. In eight of these, sixteen rabbit parathyroid were used, in four, ten dog parathyroids. The technique of Payr was followed with some modifications. The implantations were made from eight to twenty-eight days prior to one of the above operations for removing the normal parathyroids, except in one case where the implantation and parathyroidectomy were done simultaneously.

#### CONCLUSIONS

From the preceding considerations it is evident that the removal of all and possibly even of a part of the parathyroid bodies results in tetany, that the symptoms of this disease are striking, that the diagnosis is usually simple, and, finally, that efforts directed towards its cure have not as yet been proved to be successful.

In the case reported at the beginning of this paper, the diagnosis of tetany was based, in the absence of thorough electrical tests, first, upon the fact that the patient had never presented any hysterical or other nervous manifestations previous to the onset of the typical clinical features of tetany four days after an operation for goiter which thus supplied a direct anatomical basis for the disease. second, on the analysis of the symptoms, the most suggestive features being the frequent attacks of symmetrical and bilateral tonic contractures of hands and feet, the involvement of the flexor muscles exclusively, the

presence of Chvostek's and Trousseau's signs the latter characterized by slow contractions accompanied and preceded by cramp-like pains the additional demonstration of the mechanical excitability of the motor nerves by the stretching of the sciatic nerve and nerves of the brachial plexus and finally the fact that coincidentally with the typical spasms all of the above tests disappeared

Assuming then that this was a case of true tetany the explanation must be that at her former operation in Bern two parathyroids were removed with the left lobe of the thyroid. Since no symptoms occurred until after my operation this was undoubtedly the cause presumably through the sacrifice of sufficient parathyroid tissue to upset the functional equilibrium which must have been at that time very unstable as the result of the previous operation. It is not possible that both the remaining parathyroids were sacrificed for in that case a fatal tetany would undoubtedly have resulted. Since no parathyroid could be found in the tissue removed it is probable either that the lower and inferior one of the right side was crushed in the clamp which was placed across tissue in which this body sometimes lies or that the blood supply of one or both of the parathyroids on this side was interfered with by the ligation of the inferior thyroid artery. The latter explanation was suggested to me recently by Dr W G MacCallum.

In this case although improvement and apparent cure resulted during the administration of Beebe's nucleo-proteid and after the subcutaneous implantation of human parathyroids the fact can not be lost sight of that the improvement may have been due to a compensatory hypertrophy of the upper right parathyroid body which is supposed to have been left. Although it seems probable on the basis of this case and the investigations of others that by appropriate organotherapy the symptoms of tetany can be controlled at least temporarily during the administration the question has not been definitely settled. Moreover the effect of transplantation is still problematic. From animal to man it offers no prospect of success and we are forced to admit that it is uncertain whether para



thyroids transplanted between animals of the same species, even under the most favorable conditions, can functionate, even if they do survive. It is consequently equally questionable whether they can grow and functionate when transplanted from man to man. Although subcutaneous implantations seem warranted on account of their freedom from danger and the possibility that they were effective in the case under discussion, the obvious technical difficulties and dangers of implantation into such a place as the spleen, are so great as to forbid the attempt until success in animals has been thoroughly demonstrated.

Considering then the uncertain status of all proposed methods of treatment, the importance of prophylaxis is self-evident. In this connection it is significant that the frequency of the disease has markedly diminished since the adoption as routine practice of leaving part of the thyroid in goiter operations.

The practical side of this subject has been furthered by recent researches only in so far as it has been demonstrated that not merely sufficient thyroid must be left in order to prevent the occurrence of myxedema, but also that a definite part of the thyroid must be retained in order to ensure sufficient parathyroid tissue and thus guard against tetany. The truth of this statement is demonstrated by the case presented in this paper and by the cases of tetany following partial parathyroidectomy collected by Pineles and quoted above with later additions.

The operator must attempt to leave at least two of these bodies in situ, with blood supply unimpaired. When we consider how difficult it is to locate the parathyroids at autopsy on account of their small size and variable situation, it is evident that under the conditions which prevail in an operation, their recognition could not be depended upon and would prove a matter of chance. Therefore, in order to preserve the parathyroids, it is necessary to leave the posterior part of at least one lobe of the thyroid, in connection with which two of these bodies usually lie. Whether this is done by leaving one lobe

completely or in part is a matter for individual choice in a given case but in pursuing either course the thyroid vessels especially the inferior on this side should not be ligated. The practice of leaving the isthmus only is obviously a very dangerous procedure. In addition to ensure still further immunity from tetany even when one entire lobe or the posterior part of a lobe is left certain precautions should be taken if the whole of the other lobe is removed. In the removal of this lobe the dissection of the thyroid gland should be carried as close as possible to the true capsule of the organ and independent small bits of tissue should be sought for in this situation stripped from the thyroid and left uninjured. Moreover in ligating the inferior thyroid artery on this side care should be taken to avoid including in a ligature or clamp the inferior parathyroid which frequently lies in close relation to this vessel.

From the preceding review and discussion it is evident that numerous questions relating to the parathyroid bodies and tetany are still unsolved. Two important points however may be accepted as proved by the overwhelming evidence of experimental and clinical observations first that tetany following goiter operations is due to operative interference with the parathyroid bodies and second the corollary of this that in operative procedures parathyroids and their blood supply must be maintained inviolate.

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# OBSERVATIONS UPON A FORM OF EXOPHTHALMIC GOITRE OCCURRING IN A DOG

BY CARL EGGERS M D

AND

J W DRAPER MAURY M D

OF NEW YORK.

THE history of this case was briefly as follows

The mother was an imported Irish terrier brought over on a cattle ship. She was badly treated during the trip and also for some time after her arrival in this country. At length she was picked up by a stable hand who kept her in a rather cold dark and damp stable. Her neck had always been noticeably full but not remarkably so. Under the stable man's care she revived and became bright and active. About eight months later she gave birth to a litter of pups. These were sired by a thoroughbred Irish terrier. He also had been kept under poor hygienic conditions in the cellar of a saloon.

There were five pups. One a female was drowned at birth. Another died early from some unknown cause. About three weeks later the remaining pups were all observed to have a swelling in the neck and they seemed to be weak in the rear hind quarters. Unfortunately no particular attention was paid to them until one died with symptoms that were noticeably like those of exophthalmic goitre. The two remaining pups were then seen by a member of the Surgical Research Laboratory staff. He noted that the thyroid gland was markedly enlarged, that the hind quarters of the dog were very weak, that the pulse was exceedingly rapid and that there was a very marked movement of the thoracic wall and indeed of the whole body due to the violent heart action. A very fine muscular tremor was quite marked.

One of the two remaining pups died before operation was decided upon and the body unfortunately was destroyed before an autopsy could be performed. The last pup was then taken to the Laboratory and there presented the following symptoms:

A very marked swelling of the thyroid gland which was more prominent on the left side. It was elastic and throbbled synchronously with the pulse. The pup was extremely weak in the back and hind legs. When the photograph in the accompanying cut was taken the animal was unable to stand and had to be supported as shown. There was very marked tremor. Little or no exophthalmos was present. The pulse had exaggerated force. It ran between 160 and 170 and was of high tension.

Upon the history the presence of the tumor, the tremor and the

tachycardia, a tentative diagnosis of exophthalmic goitre was made and operation decided upon

The dog was given a dose of morphine hypodermically and when under its influence was anaesthetized with ether. The thyroid gland was exposed through a median incision. It was found to be enormously enlarged and to have an abnormally large vascular supply. The left lobe was larger than the right. The isthmus was ligated in two places and was carefully divided between ligatures. The gland was found to be well encapsulated and it shelled out easily. The parathyroids were not seen. The wound was washed out and closed with a continuous silk suture and dressed with a formalin pad. The pup re-acted well after the operation.

The next day an immediate improvement was noticeable in the animal's condition. The pulse rate had fallen to 120 and the impulse of the heart-beat against the chest wall had diminished very appreciably. Prior to operation it had been possible to count the heart beats by simply looking at the animal's body. After operation, this could no longer be done.

Four days after operation, the pulse had reached 90. There was no longer any impulse transmitted to the hand. The animal's general condition improved rapidly. He gained weight and all tremor disappeared. Weakness, however, persisted for some time, but at the end of two weeks, he was in a reasonably normal condition. The animal lived for six weeks after operation and died without giving any manifestation of a recurrence of the symptoms described.

Dr MacCallum, of Baltimore, in speaking of this case, said

"I should think it difficult to make a definite diagnosis of exophthalmic goitre in a dog, but I think the histological character of the goitre would furnish the best evidence of the nature of the condition. The literature is very meagre and I think any such case ought to be reported." Dr F C Wood, of the Path Dept, stated that this gland, a section of which is here shown, presented the usual morphology of exophthalmic goitre. His language is as follows

"The microscopical examination of the thyroid tumor which you sent me some time ago, shows a growth of the type which we are accustomed to see in exophthalmic goitre in man."

Woods Hutchinson says "I can quite readily imagine such a condition of affairs developing in the dog, as ordinary cystic and fibrous goitres are quite common in the species and generally give rise to few or no symptoms except those connected with their size. Similar conditions are also fairly common in horses and sometimes give rise to some difficulty, through pressure upon the trachea, and pneumogastric. I have also reported briefly a number of cases of cretinism occurring in puppies in goitrous regions, particularly in the Yakima and Puyalap valleys in Washington."

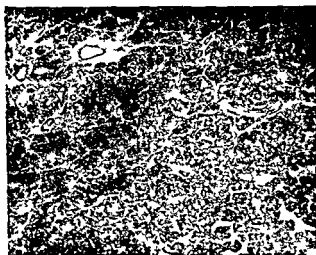
Wesley Mills, the well-known authority on dogs, writes from McGill University in reference to this case "I have worked upon the effects of removal of the thyroids and parathyroids in dogs and I have seen a good many cases of ordinary chronic enlargement of the thyroid, but such an

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acute case as you have had the opportunity to study has not come to my notice. In all my study of the dog I have been impressed by his resemblance to man both physically and psychologically. The chronic enlargement of the thyroid always gave way in my experience to the treatment usually employed for human beings. I see no reason to doubt that your case was one of exophthalmic goitre.

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# EXPERIMENTAL STUDIES UPON THE THORACIC ŒSOPHAGUS—A PRELIMINARY REPORT

BY NATHAN W GREEN, M D ,

AND

J W DRAPER MAURY, M D ,

OF NEW YORK

THE purpose of the experiments outlined in this report is to determine what can be done transpleurally in the treatment of œsophageal stenosis while using the more simple positive pressure method of overcoming the embarrassment necessarily due to collapse of the lung during open chest work

A few words may first be said concerning the apparatus used, the construction and the method of introduction of the intra-laryngeal tube The air pump and valve is that designed by Mr J T Hoyt of the physiological department and is of the type mentioned in a former paper<sup>1</sup> The means of conveying the ether vapor is also the same as used in the experiments detailed in that paper The canula, however, is much simpler and consists of a plain 8 mm brass tube 12 in long slightly curved and rounded at the laryngeal end and supplied with an obturator which tightly fits the rima glottidis This consists merely of a few turns of surgeons' plaster so wound around the tube as to make a fusiform enlargement of about 12 mm at its maximum diameter (see photo, Fig 1) In the side of the tube near the aboral end is bored a small hole of about 2 mm diameter This serves as vent for the expired air Around the tube is a small collar, a piece of tubing, which may be slipped over this aperture when it is necessary to inflate the lungs thoroughly before closing the chest wound The aperture is sufficient for all expiratory purposes No partial

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<sup>1</sup>The Positive Pressure Method of Artificial Respiration with a Practical Device for its Application in Thoracic Surgery—Surgery, Gynecology and Obstetrics, May, '06





vacuum is used as it was demonstrated to be unnecessary. The intubation tube is held firmly in place by a light clamp made by incurving the blades of an Otis meatal dilator. This clamp is applied oral to the hyoid bone and is so adjusted as not even to bruise the skin under the floor of the mouth. Yet this simple appliance serves to hold the intubation tube firmly in place and it was noticed repeatedly that neither the pressure from this clamp nor that exerted by the tube itself upon the vocal cords was sufficient to cause the least sign of paralysis. This was shown by the ability of the animal to bark immediately after recovery from anæsthesia.

The introduction of the tube is a very simple matter if attention be given to the following details. In the first place the primary anæsthetization must be profound. The dog should then be placed squarely on its back with head extended. An attendant slips a towel over the canines of the upper and another over those of the lower jaw holding the mouth very widely open. The operator then holds the tongue in a third towel and draws it forward until the epiglottis is seen. If strong sunlight be thrown from above on the exterior of the neck the proceeding is much facilitated for it gives a very striking illumination through the tissues and enables the operator to place the tip of the intubation canula directly in the open rima.

Having completed the intubation and having secured the tube with the clamp the dog is placed on its right side a small cushion being tucked underneath the body opposite the site of the operation.

The 6th intercostal space is then located by counting from below up. The skin and superficial muscular incision is made over this space. The tissues are then drawn downward and the pleural cavity opened by sectioning the intercostal muscle midway between the ribs in the 7th space. This gives on closure of the wound an air tight flap—a condition very necessary in the dog as leakage of air into one pleural space causes collapse of the opposite lung owing to the mobility of the soft parts forming the mediastinum.

Before the pleuritic layer is opened the condition of the lung should be studied by direct inspection and the amount of expansion regulated. This can easily be done as the pleura is quite transparent. Regulation of the expansion may be effected by gauging the volume of air delivered and by changing the size of the expiratory vent by the rubber collar already referred to.

Having opened the pleura, the ribs are then drawn apart and a self-retaining retractor inserted. This retractor, as shown in the photograph (Fig II), consists of a bent brass rod, it having been found more serviceable than the larger instrument designed for human use. The lung is then held out of the way by delicate retraction. This allows an immediate and unobstructed view of the œsophagus, for the ribs at the point of entry separate quite freely<sup>2</sup>. The vagi are usually found as two large trunks with a diagonally communicating branch. From this point on the manipulations must be of the most delicate nature possible. The vagi are carefully separated from the œsophagus by sharp dissection for a distance of 5 cm. Unavoidably much of the serous covering of the œsophagus is removed at this time, but it should be preserved so far as possible. At a point about 1 cm. oral to the point of investiture of the œsophagus by the diaphragm, a cuff of serosa is separated by circular incision around the œsophagus and this cuff is stripped down until the stomach appears in the wound.

The beginning decussation of the vagi on the stomach and the vessels, with the frequent exception of one branch which must be tied—are pushed back on the stomach. At this point the peritoneum appears on the left side and must be opened about half way around the œsophageal end of the stomach. After carefully protecting the cavities by pads a portion of the gastro-œsophageal juncture 2 cm. or more in length is removed. Clamps should not be employed as their use may be followed by a late perforation at the point maximum of pressure. Two retraction Lembert sutures are placed

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<sup>2</sup> See abstract Sauerbruch's recent technic *Kocher Chirurg Op V* auf p 737 *et seq*





FIG III



Figure showing appearance of tissues and relations of parts after intra abdominal sequestration of gastro-oesophageal union P, pylorus, L, line of union (between pins) where normal opening of oesophagus was closed, N, new line of union of oesophagus to stomach D, diaphragm which is seen to be oral to N, O, oesophagus, P Pylorus V v. 19.1

in the oral part of the oesophagus which is then drawn up into the thoracic wound the opening plugged with gauze and the stump covered with a pad. The wound caused by the resection of the gastric wall is then closed by a three layer suture and the stomach is dropped back into the abdominal cavity. An adjacent portion of the cardiac end of the stomach is then grasped in the fingers and drawn up into the chest. Two retraction Lembert sutures are placed in the stomach and this organ incised between them. An end to side implantation of the oesophagus into the stomach is then made according to the usual method three layers of silk sutures being used. The stomach is then dropped back into place again and the diaphragm sutured to the oesophagus oral to the point of union with the stomach so making the gastro-oesophageal suture line intraperitoneal and within reach of the omentum (Fig III). The chest cavity is then freed from any blood clots remaining the positive pressure is slightly increased and the chest wound sutured in layers leaving a small opening for the escape of air while the lungs are fully distended. This is finally closed and the operation is completed.

The conclusions from these incomplete studies are as follows

Intubation practised with the simple instruments described is thoroughly practical and for all surgical research work should supersede tracheotomy.

Positive pressure if supplied with a proper cut-off valve is a simple and efficient means for producing artificial respiration in surgical work. We have had no death directly attributable to it.

The flap formation in the chest wound is an important point in the technic.

The protection of the pleural cavity from infection must be rigidly enforced and when the point of resection is near the cardia this may be conveniently accomplished by the sequestration of the gastro-oesophageal wound into the abdominal cavity. The omentum will then apply itself to the wound area as in any intestinal operation.

Efforts to carry a portion of the omentum into the chest in order to profit by its protecting influence in case the wound area was too oral to allow of intra-peritoneal sequestration were sometimes successful, but it is difficult to maintain the omental blood supply by the method we employed

In connection with these experiments we wish to report that we have tried gastro-oesophagostomy by means of the Murphy button—by means of end-to-end suture bringing the stomach up through a new opening in the diaphragm—by a lateral anastomosis, by one and also by two stages—and by the twine triangular stitch<sup>3</sup> This last method we found very satisfactory in side-tracking the natural cardiac orifice The photograph (Fig IV) shows a view of a specimen so obtained Our experience to date leads us to the belief that this or a two stage operation will prove to be the one of election, for the simple one stage intra-thoracic oesophageal section has a very high per cent of septic mortality (in dogs)

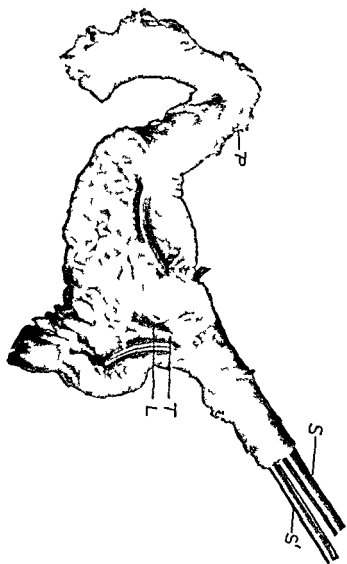
We have also attempted Roux's method<sup>4</sup> of oesophago-jejunosomy His technic was followed in all respects save that the gut segment was carried up through the chest instead of subcutaneously Kocher,<sup>5</sup> after describing the method outlined by Roux, states that he essayed it on a man but was obliged to proceed to simple jejunostomy because of the failure of circulation in the isolated jejunal segment Our results appear to justify the conclusion that in dogs at least the isolation of a portion of the jejunum by Roux's method is impracticable because of circulatory failure

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<sup>3</sup> Twine in lieu of the elastic ligature for performing gastroenterostomy, Jour A M A, Sept 17, '04

<sup>4</sup> Semaine Medicale, Jan, '07

<sup>5</sup> Chirurgische Operations lehre, p 907





# STUDIES UPON THE FUNCTION OF THE PYLORUS AND STOMA AFTER GASTROENTEROSTOMY HAS BEEN PERFORMED

BY NOEL BLEECKER LEGGETT M D

AND

J W DRAPER MAURY M D

OF NEW YORK.

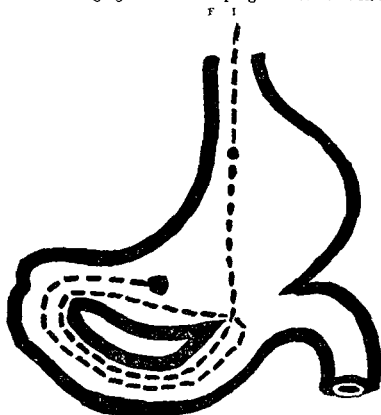
A GREAT deal of speculation has been indulged in as to the physiological conditions which exist after the operation of gastroenterostomy. Undoubtedly the most important and thoroughly scientific and accurate observations were made by Cannon in his recent studies at the Harvard Medical School. Together with Murphy he performed the operation of gastroenterostomy on a large number of cats and after full post operative recovery studied the animals intestinal mechanism through the agency of the fluoroscope. He found according to these observations that all food was driven by the muscular contractions of the stomach through the pylorus the stoma playing no practical part in alimentation. This was a profoundly important contribution.

About a year ago the class in operative surgery at the Surgical Research Laboratory at Columbia University performed the operation of gastroenterostomy. We were making some observations upon the efficacy of various forms of superficial dressings and in this particular case a certain dressing was applied upon a small piece of gauze. While not under observation the animal picked out the smaller dressing from under the external bandage and swallowed it. Some time after this he was chloroformed for the purposes of study and upon opening his stomach the gauze was found trailing through the stoma. We were immediately interested in this because Cannon's observations had just been published. Unfortunately no record was made as to the direction taken by the tip of the gauze which had passed through the stoma. This is unfor

tunate, because later observations suggest that solid bodies, which pass through the stoma, may all travel toward the pylorus

During the past winter we determined to study this interesting problem of pyloric and stoma function and decided to investigate it from three standpoints, viz (1) By studying the course taken by solid particles which were tied to a string (2) By feeding fat and studying the condition of the lacteals an hour later (3) By performing gastro-colostomy or gastro-ileostomy near to the valve and making observations upon the weight of the animal For the feeding of string, no originality can be claimed, it having been used for many purposes notably by Abbe and Dunham The particular purpose to which we have put it, however, we believe to be original We conceived the idea that if gastroenterostomy were done and time allowed to elapse for the perfection of healing and for the establishment of any new physiological functions to which origin might be given by the operation, it would be fair to assume that solid food particles ordinarily passed on and digested, would take the same course as indigestible solid particles tied to string The dogs accordingly underwent gastro-duodenostomy or gastro-jejunosomy, as the case might be, the technic being that of open incision and suture Not less than two weeks later, they were permitted to swallow a piece of meat in which a small bullet, tied securely to the end of a piece of string, was embedded A dog lends himself favorably to this manœuvre, because of his natural voracity In an instant the meat, bullet and one end of the string are in his stomach The next part of the procedure consists in anæsthetizing the animal to very profound narcosis On separating the jaw very widely the pterygomaxillary ligament is brought clearly into view The string being threaded on a short curved round needle is quickly passed through the ligament and tied This should be done loosely so as not to cut through Another point in the technic is that the string should not be tied to the meat it being preferable probably to wrap it once or twice tightly around it

The pterygo-maxillary ligament is situated so far aboral to the teeth that the animal does not bite the string off and it remains hanging down the œsophagus. Its situation is so far



LINE DRAWING OF A SPECIMEN OBTAINED BY PERMITTING A DOG TO SWALLOW A PIECE OF STRING BAG OF SHOT TIED TO END PASSED THROUGH THE ST. MA, DUODENUM AND PYLORUS TWICE. THE SAME FORCES MAY CARRY MURPHY BUTTONS FROM THE QUT INTO THE STOMACH.

STRING TIED IN PHARYNX TO PTERYGO MAXILLARY LIGAMENT back in the pharynx that the string will remain for days in this position without creating any choking or discomfort of any kind whatsoever.

It is difficult to get the string to pass out of the stomach. If it is too long it simply rolls up and lies in the stomach.



imbedded in a mass of mucus and food. If too short, it will obviously not have the requisite length to give a demonstration of the facts under investigation. We are fortunate in having secured a specimen which Dr. Brown has mounted very beautifully, and of which both a photograph and a line drawing are shown in the illustrations Figs. I and II, it will be seen that the bag of shot passed directly into the stoma and instead of travelling aboral, it proceeded oral, Fig. II, toward the pylorus through it and into the stomach. Following the trail of string which it left behind, it can again be traced over exactly the same ground. This study appears to prove that at least under certain conditions and at certain times solid materials do pass through the stoma even when the pylorus is left untouched and it is in normal condition. This is further suggested by Fig. III, which shows a piece of *bone* lodged in the stoma. The results of further string feeding are shown in Fig. IV. This string passed direct through the pylorus. Thus some strings pass one way and some the other way. Figs. V and VI illustrate the same point.

*Pyloro Stoma Function as Demonstrated by the Lymphatics*—We are fortunate in being able to report one case which lent itself very favorably to this demonstration. We had fed the dog string, and it had worn the string for the usual period of about 24 to 48 hours, when we determined to feed it fat prior to chloroforming it. About one hour after the fat meal, the animal was opened under profound anæsthesia. The gastro-ileostomy had been situated near to the ilio cecal valve, as shown in Fig. VII. By good fortune the mass of meat in which the string with its shot had been imbedded proved to be of a very indigestible type, and it was discovered considerably macerated but still in statu-quo lodged in the ileum about 20 centimeters oral to the stoma. The lymphatics of the duodenum from the very beginning of the mid gut, viz., some four to five centimeters aboral to the pylorus, were loaded and distended with emulsion. This, parenthetically, affords a convenient means of observing the similarity in function of the stomach and first portion of the duodenum from which no

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FIG III

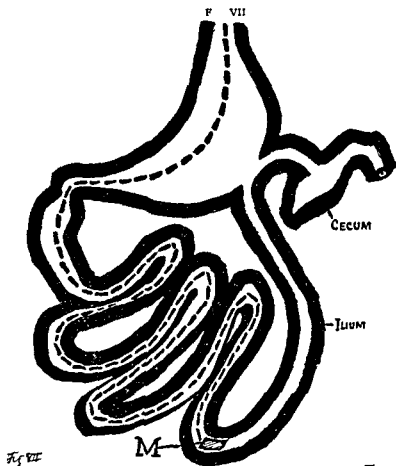




St 3 f f Py1 ru



absorption whatsoever seemed to be taking place two structures morphologically very dissimilar but shown functionally to have a common origin in the primitive foregut



THIS DOG SWALLOWED MEAT WITH STRING ATTACHED TWO DAYS LATER WAS FED FAT KILLED ONE HOUR LATER LYMPHATICS ORAL TO POINT M WHERE MEAT LODGED IN GUT WERE GORGED THOSE ABORAL TO M WERE EMPTY PROVES THAT FATS DO NOT PASS THROUGH STOMA

The lymphatics of the entire intestine from the second portion of the duodenum down were well filled This lymphatic congestion terminated abruptly opposite the piece of meat which was lodged in the ileum and held there in place by

the string On the aboral side, viz, for a distance of about 20 centimeters between the lodged meat and the stoma, it was positively demonstrated that no absorption whatsoever was taking place Aboral to the stoma there was also no lymphatic engorgement In this particular case, it therefore seemed that probably no fat had passed through the stoma, that all had gone through the pylorus This, of course, presupposed that pancreatic secretion had passed beyond the meat

These two studies are suggestive and are to be followed by more of a similar nature which are in course of preparation at the laboratory It may well be that some slight variation in the technic as to length of loop, direction of incision in the stomach wall, position on anterior or posterior wall, mode of attachment of intestine to stomach and other even less significant factors may play parts at present entirely unknown in determining the function of the stoma in the presence of an unobstructed and natural pylorus It has been thought (Mayo and others) that the stoma should be made at the most dependent portion of the stomach in order to functionate This can be readily understood to be of great importance in the presence of atonic dilatation and pyloric obstruction Our experiments, as yet incomplete, seem so far to show that the position of the stoma makes no difference in its function, at least we have not as yet been able to determine that it does

*Observations on Stoma Function by Recording the Weight of the Animal*—If a gastro-ileostomy be done very near the valve or if one goes so far as to perform gastro-colestomy, a study of the weight of the animal after this operation cannot fail to throw some interesting light upon the function of the stoma Moreover observations on the feces are also not without importance, because if passed directly through the stoma, they would not have undergone digestive processes Graphic charts of the weights of our animals have not yet been made, neither have the feces been examined microscopically or chemically Gross examination however has as yet failed to show any difference in the feces of dogs operated on in this manner from those of unoperated dogs, and our observations

on weight appear to show that for a time after operation the dogs usually thin and in rather poor condition having been half starved on the streets frequently gain in weight for about a week. They are then apt to lose weight rapidly for a week and even though fed carefully with milk and dog biscuits are prone to die at the end of the second or third week from inanition. Autopsy findings rather constantly show the long loop to be somewhat dilated and filled with soft grumous material. Pretty well marked spur formation at the side of the stoma has been a constant feature in these cases. Further study alone by means of feeding string and fat by the technic and at the times herebefore described will alone answer the question why these dogs should at first gain then lose weight and why inanition and exitus should subvene so rapidly. It is not improbable that the profound nutritional changes that certainly do accompany many of these stoma experiments are due (Turck) to interference with normal colon bacillus action or to the establishment of chemical reaction unfavorable to digestion. In any event the experiments support Blake's contention that gastroenterostomy should not be done except in the presence of pyloric stenosis.



# IS DEATH IN HIGH INTESTINAL OBSTRUCTION DUE TO THE ABSORPTION OF BILE? \*

BY J W DRAPER MAURY, M D,

OF NEW YORK,

Fellow of the Rockefeller Institute

IT is well known that acute intestinal obstruction occurring in the duodenum or oral portion of the jejunum is much more rapidly fatal than a similar obstruction occurring aboral to this portion of the intestine

A rather careful study of the literature of the subject has failed to show that any definite cause has been discovered for this well known fact, everything to date being suppositional in character. So recent and so high an authority as M. Wilms, whose extensive monogram on ileus has just appeared, in discussing high intestinal obstruction says "The time in which duodeno jejunal obstruction causes death has only in the rarest instances been prolonged. Death usually subvenes with extreme rapidity. All patients probably succumb to toxic absorption resulting from the decomposition of intestinal and stomach contents."

Starvation and lack of absorption of water, which has been thought by some to be a factor in producing the syndrome of duodeno jejunal obstruction, are hardly to be considered, particularly when one reflects that absorption of water takes place almost entirely from the colon and can therefore not be materially influenced by the position of the obstruction in the small gut. For, as Mayo says, we drink with our great gut and eat with our small. Wilms makes no mention of the possible relationship of the biliary and pancreatic fluids as a cause of death in duodeno jejunal obstruction.

Neither are these the only suggestions which have been offered as an explanation of the phenomena under discussion

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\* A Research conducted under a Fellowship granted by the Rockefeller Institute

Boszky and Genersich offer two theories to explain the symptoms in intestinal obstruction viz reflex and auto intoxicational They believe that bacteria and their toxins pass through the intestinal wall that the slow pulse and other phenomena are caused by the interference with the vagi and splanchnics which causes congestion of the abdominal organs thus giving rise to anemia elsewhere noticeably in the brain The anuria which is characteristic of this condition is due in the opinion of these two authors to exhaustion of vaso dilators of kidneys and the drop in temperature to exhaustion of the heat centre all due to cerebral anemia But they continue in cases of obstruction by enteroliths these symptoms cannot be explained on the ground of nervous phenomena Here it must be chiefly an accumulation of feces and ptomaines and toxins due to *putrefaction of intestinal contents*

Here again in an exhaustive German monograph attention is called to the importance of putrefaction of the intestinal contents Observations which we have made in the Laboratory show conclusively that putrefaction has nothing whatsoever to do with the cause of death in intestinal obstruction at least when the seat of obstruction is within 35 centimeters of the pylorus

Accidentally in the beginning and more recently voluntarily we have studied this obscure but exceedingly important problem It will be necessary in order to make our results clear to give a short history of the manner in which the subject has been approached

In a series of experiments conducted in the Surgical Research Laboratory of Columbia University and which were carried on to find some practical method of performing a gastroenterostomy by the so called closed method it was noticed that under certain constant conditions the animals operated on invariably suffered a similar train of symptom which were always followed by a pseudo tetanic form of death The pathological picture marked by fibrillary muscular twitchings weakness and later rigidity is not unlike that presented after a parathyroidectomy The conditions which

united to cause this precise form of death are shown in the accompanying outline (Fig 1) They consisted in the performance of a gastroenterostomy by a closed method and the severance and closure of the short duodenal loop The actual technic of effecting the establishment of the stoma is not of immediate concern here It was made by what has been called

FIG 1

INTESTINAL OBSTRUCTION AT A  
POINT JUST ABORAL TO DUCT OF  
SANTORINI.

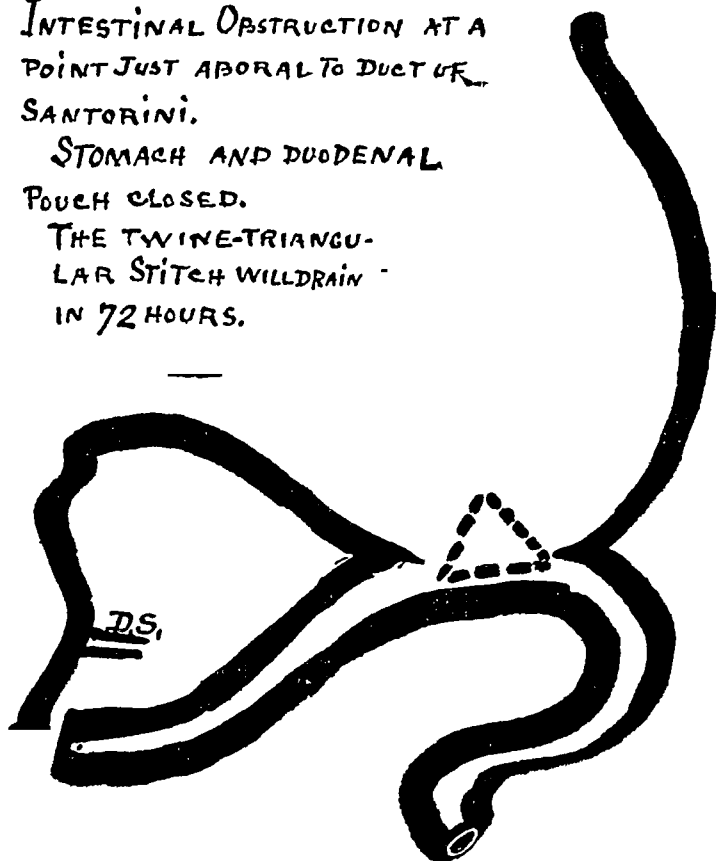
STOMACH AND DUODENAL  
POUCH CLOSED.

THE TWINE-TRIANGU-  
LAR STITCH WILL DRAIN  
IN 72 HOURS.

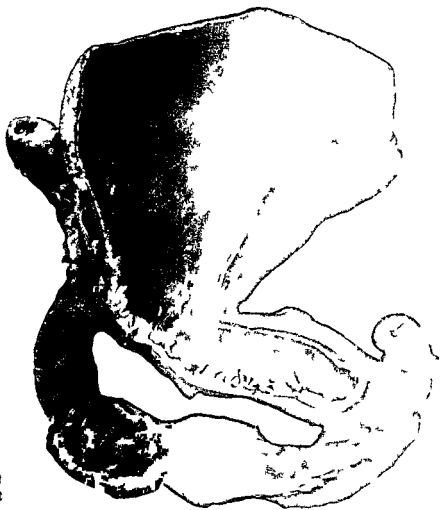
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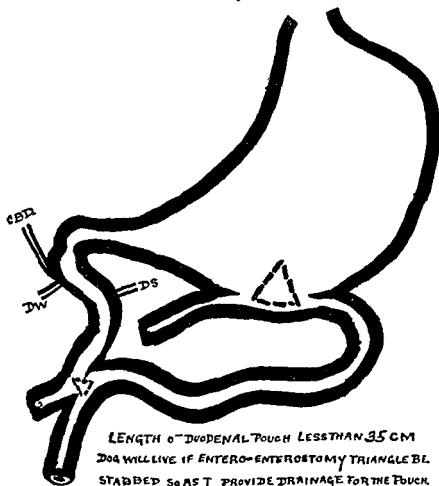
in previous communications the *twine triangular stitch*. It is necessary, however, to emphasize the fact that this triangular stitch, which is a simple substitute for the McGraw elastic ligature, has been introduced in all the series as a control. It is of great use for experimental purposes when it is desired to close the stomach for a constant number of hours and subse-





quently to have drainage re established The twine cuts a punched out opening at a period of from 70 to 100 hours This varies in different subjects but in long series a general average will be maintained This is the first point to make clear

F 3.



In the second place it was found that the length of the loop from the pylorus to the invagination was the essential factor in determining whether or not the animal would live It was shown after many tests that if the distance from the infolding to the pylorus was less than 35 centimeters it would die before

the twine triangular stitch gave drainage (70 to 100 hours)  
If the loop were longer, the animal would live

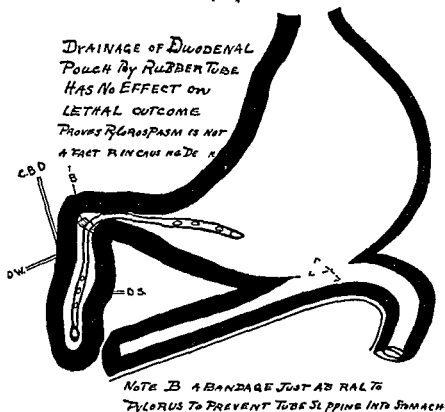
The third point is this It was suggested by Dr Flexner that this pseudo-tetanic death might be ascribed to decomposition of food materials in the stomach and duodenal loop A number of experiments, however, upon fasting animals demonstrated that the presence or absence of food material in the stomach had no effect whatsoever in modifying the influence already alluded to of length of loop Animals with stomachs well filled and those with alimentary canals thoroughly emptied showed no variation whatsoever in character or rapidity of death The lethal line in either case was always approximately 35 centimeters from the pylorus

There was a fourth point of importance The question arose Was the disturbance of innervation at the pylorus responsible for the death of the animal? A series of six dogs were operated on in the following manner The pylorus was either sectioned or resected together with a small amount of stomach, and the ends infolded, great care being taken not to injure the bile duct Twine triangular ligature was then inserted to create a gastroenterostomy Without exception these animals lived until after the stoma had been established This led to a most important conclusion It showed that if the section and blockage of the duodenum were made oral to the bile duct, so that drainage were maintained for hepatic and pancreatic secretions, the animal would tolerate the absolute closure of the stomach without any ill effect until this viscus were drained by the establishment of the stoma 70 hours later It is of great import to notice this, for it shows that, the nervous element owing to shock produced by section of the gut in the neighborhood of the pylorus, which has long been recognized to be a serious factor from a vital standpoint, in all operations in this neighborhood has absolutely nothing to do with this form of death which we have described as pseudo-tetanic It suggests that the biliary or pancreatic secretions, or both, stand in some very definite relation to the lethal results observed Pseudo-tetanic death occurring so constantly after section aboral to

these ducts and so rarely when the section was made oral to them is indicative that some profound interruption of normal chemical processes in the intestine produces the fatal result rather than any nervous disturbance or shock.

It should be emphasized that the animals will live with a blocked loop less than 35 centimeters in length if the stoma be made an open one. Drainage of the stomach into the intestines

F 4



suffices to save the animal's life no matter where the duodenum may be blocked.

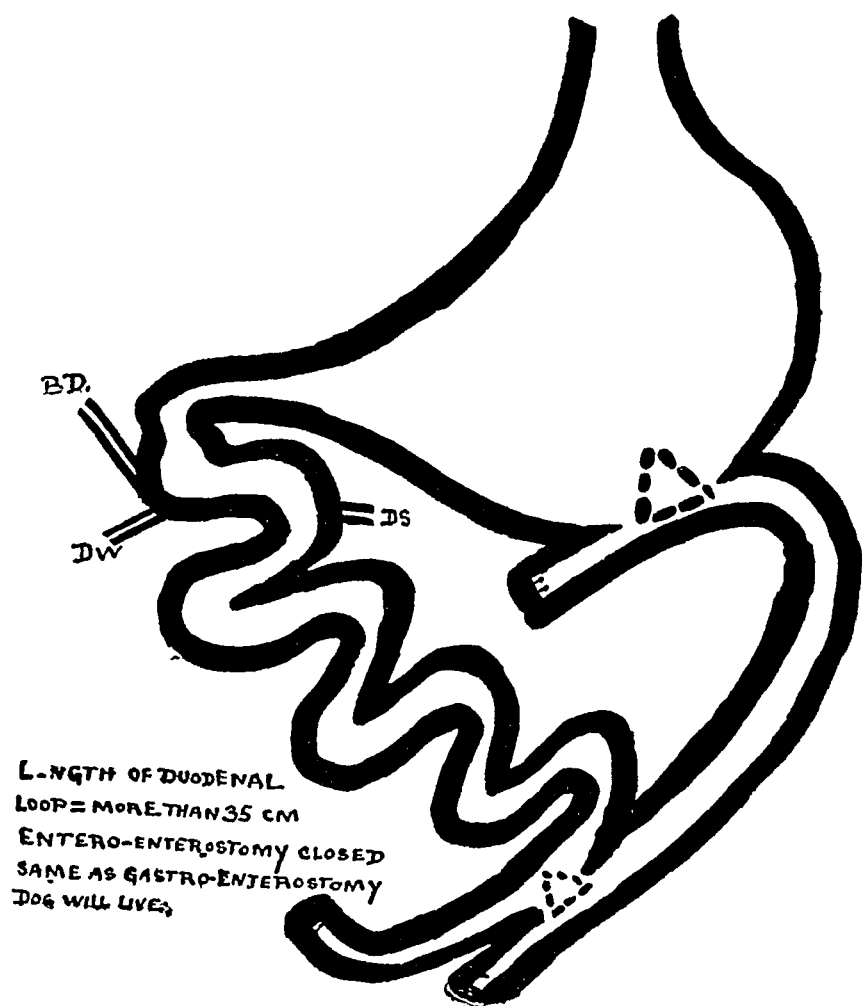
It was further determined that the effect of entero-anastomosis between the jejunum just distal to the gastroenterostomy and the closed duodenal loop just aboral to the entrance of the ducts gave a similar result. Dogs operated on in this manner live. In other words drainage of the loop is as



effectual in preventing the lethal results as is drainage of the stomach

Moreover the fatal outcome is not the result of a closure of the loop produced by pylorospasm The figure (4) shows how the proof of this was obtained Rubber tubes placed so

FIG 5



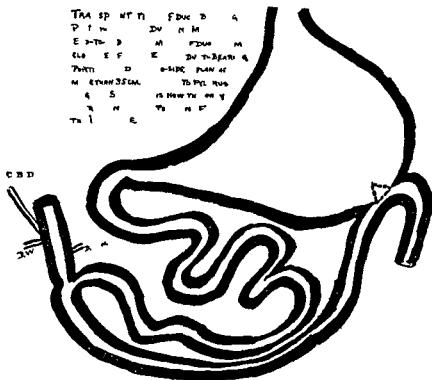
as to connect the loop with the stomach failed to be instrumental in preventing death Drainage of the loop into the stomach is therefore shown to be without effect in preventing death

Having eliminated nervous shock, as the source of lethal

impulse as well as poisoning from food decomposition obviously it became evident that the cause of death might lie in the production of poisonous substances produced by a mixture of the biliary and pancreatic secretions. It seemed possible moreover that this hypothesis might give us the real explanation of the fact that 35 centimeters or more of intestine in the closed duct bearing portion sufficed to avert fatal results. For we may conceive that in this length of intestine such a quantity

F 6

TAA SP WT N F DUC D G  
 P I W DV N M  
 E 2-TB D M F DUC M  
 ELA E F E DV T-BEAT G  
 POTTI D G-SIDE PLAN AT  
 M ETHAN 35CM TO PEL RUG  
 G S IS NEW TH ON Y  
 R N TB N F  
 TA I E



of diluting material may constantly be furnished as would be adequate to render harmless the mixture alluded to. This supposition seems to be corroborated by the recent discovery of Flexner that the biliary salts unless in colloidal suspension act as violent poisons. He states (Jour Exper Med 1896 p 174) that the conclusion may be drawn that the suspension of bile in a bland mixture of high colloidal strength protects

the pancreas from the immediate and acutely injurious action of the biliary salts "

Further, on page 167, he continues " Bile contains two sets of constituents of highly different chemical composition crystalline principals and colloids The biliary salts are known to act injuriously upon the cells while no direct cellucidal property is known either for the biliary coloring matter or the mucin "

None the less convincing as to the toxicity of the bile are the studies of Meltzer and Salant They state (Jour Exper Med , 1906, 8, p 159) " We have positive and direct proof that normal bile from many rabbits possesses an exciting element capable of producing chronic convulsions in frogs " Page 165, " that contrary to the prevailing opinion, bile contains a tetanic element or an agent which causes increase of excitability of the nervous system That stagnant bile as in the gall bladder, etc , invariably produces coma and paralysis, that the depressive and exciting elements of the bile are mutual antagonists, that the depressive element when present in a highly effective dose is by far the stronger of the two, while on the other hand the tetanic element becomes effective apparently in a dose far below that which constitutes the minimum for the depressive element That bile salts seem to contain the tetanic element in an extremely less amount than the whole bile "

Moreover and also in support of the supposition that a true auto intoxication from biliary or pancreatic products is responsible for death in high intestinal obstruction, we quote from *Opie* (Diseases of the Pancreas) He showed by a long series of experiments that the introduction of bile into the pancreas caused either death of the animal within twenty-four hours or widespread destruction of the gland depending upon the amount of bile injected

As a means of further study of this question, Dr Blake suggested the possibility of transplanting the duct-bearing portion of the duodenum into the intestine at varying distances from the stomach This is accomplished by means of section between the bile duct and the pylorus of the first portion of the

duodenum and a second section of the duodenum aboral to the entrance of the duct of Wirsung. The segment of gut thus removed is carefully sponged out and wrapped in hot cloths. The ends of the pylorus and duodenum are then united by end to end suture. More than 35 centimeters aboral to the pylorus an end to side implantation of the segment is done the oral end beside the bile duct having been carefully invaginated. This is a difficult operation but it can be brought to successful issue. Dogs emaciate quite rapidly after it has been done so that the most recent operations practised have included a section of the intestine just aboral to the implantation of the duct bearing segment and a gastroenterostomy by means of the triangular stitch between the stomach and the gut aboral to the section. This it will be noticed by consulting the figure produces the same results from an operative standpoint as is shown in Fig. 1 except that the loop of intestine from the bile duct to the pylorus is more than 35 centimeters in one case while in Fig. 1 it is not more than 10 or 12 centimeters. These experiments are not as yet concluded.

A simpler method of testing the effect of the presence of the secretions would naturally be to tie the pancreatic ducts and the bile duct. This is easier from a technical standpoint but of course it does not produce conditions in any way resembling the normal as does the transplantation technic already referred to. Nevertheless in a number of experiments both the ducts of Santorini and of Wirsung have been tied as well as the bile duct. This series is not yet far enough advanced to enable us to make a report upon it. Some of the dogs have died and on autopsy the pancreas has been found to be exceedingly hard while the omentum has been dotted with unmis takable areas of fat necrosis. This gross evidence of pancreatic lesion has not been observed in our cases of pseudo tetanic death occurring after duodenal section and infolding just aboral to the ducts. It suggests therefore that the form of death in the one case may have been different from that in the other.

In another series of experiments the bile duct alone has

been tied with two ligatures and divided between them. Here again the series is as yet too short to enable us to make any positive statements, but several dogs in which the bile ducts were cut, have lived with a short duodenal pouch and twine triangular stoma.

A method for transplanting the point of bile entrance beyond the 35 cm line and one less difficult as well as less apt to be accompanied by adventitious pathological conditions such as fat necrosis is a simple cholecystenterostomy. This has the added advantage of separating the bile and pancreatic secretion. It is not easy to do this operation in two steps because of the formation of troublesome adhesions and done at one sitting, prolonged as it must be by gut section and infolding and by the triangular enterostomy, there is danger of death from shock or later by peritonitis from leakage. We have done two of these one-stage operations without a death by shock, but followed by fatal peritonitis on the fourth day. The third dog lived three weeks, and was killed to obtain the specimen shown in Fig 7. It is immaterial that the animals died of peritonitis—the point of interest is that they survived beyond the time which would have been possible had the bile been passing down its normal channel.

MacCallum of Johns Hopkins who, with associates, has given us a most elaborate and exact study on ileus inclines to the belief that death is due to the absorption of bacterial toxins, which enter through the impaired gut wall. Clinically Mayo and others have confirmed this assumption by observing a lowered mortality to follow a wide resection of the dilated gut. Nevertheless it seems noteworthy, first, that total exclusions of gut segments may be made which, left in the abdominal cavity gradually grow to great size (see paper of Blake & Brown in this issue) without producing any signs of toxemia, second, that this work has been done in the relatively germ-free portion of the gut, third, that obstruction is tolerated during the cutting out of the control if placed oral to the bile duct while it always is fatal before the control cuts out, if situated aboral to it.



Ph gr ph f pe m b if m d g h h d d l b ct  
 t bl h d Ch l t t m d t gl ga o-e t t y d t f  
 mm d d m m P eat d i D g ppe t l l d  
 beca i tra pl t f h bl f d od m l m D od !po h  
 l f ld d bo l d y P 4 S f 5 Ch l y t y C f  
 f m d t 7 C m 8. R m fl M b D B



In conclusion it may be said that so far as our experiment go there seems reasonable ground to believe that they demonstrate that death in duodeno-jejunal obstruction may be due to the absorption of toxic elements in the bile which are normally rendered harmless by dilution and colloidal suspension in the secretions of the small intestine That as the length of small intestine from the bile duct to the site of obstruction decreases so the diluting secretions decrease and the toxicity rises proportionately That if further experimentation definitely proves that bile is directly the cause of death in certain forms of intestinal obstruction it may be possible to lower the operative mortality For a knowledge of the pathology of a condition is the first step toward the establishment of a successful mode of treatment



# STUDIES IN INTESTINAL EXCLUSION \*

BY JOSEPH A BLAKE, M D ,

AND

R M BROWN, M D ,

OF NEW YORK

From the Laboratory for Surgical Research, Columbia University

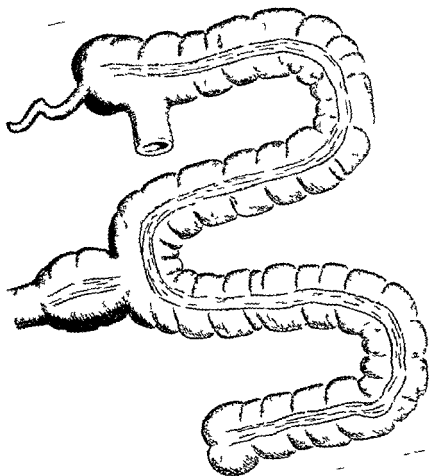
THESE studies were prompted by an operation upon a patient of one of the writers in whom, in order to reestablish the continuity of the large intestine after the resection of the sigmoid flexure, an unusual anastomosis was employed

The patient, a man fifty-six years of age, was operated on June 11th, 1906, for intestinal obstruction caused by what was supposed to be carcinoma of the sigmoid flexure but was afterwards proven to be hyperplastic tuberculosis. At operation the entire sigmoid flexure was found to be implicated in a mass which also invaded the bladder and the left spermatic cord. In order to remove it, it was necessary to sacrifice a portion of the descending and the upper part of the pelvic colon. The hiatus was so great that the ends could not be brought together without exerting undue tension, consequently the upper end of the remaining portion of the pelvic colon was implanted into the side of the middle of the transverse colon. This resulted in the formation of a blind pouch or cecum distal to the anastomosis (Fig 1). The arrangement may be termed a unilateral aboral exclusion. It was recognized at the time to be faulty but the patient's condition precluded further interference and there was no certainty that it would provoke serious trouble.

The immediate convalescence from the operation was perfectly smooth and the patient gained twenty-eight pounds in the following two months. During this time he complained at times of colicky pains and there seemed to be accumulations of gas

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\* This and the eight accompanying papers by Drs Eggers, Greene, Leggett, Maury, Blake, and Beer represent the results of studies conducted during the session 1906-07, in the Laboratory for Surgical Research, College of Physicians and Surgeons, Columbia University





and fecal matter in the excluded loop. This could be relieved by irrigations with a long rectal tube. Excision and division of the loop were considered but were not advised on account of the

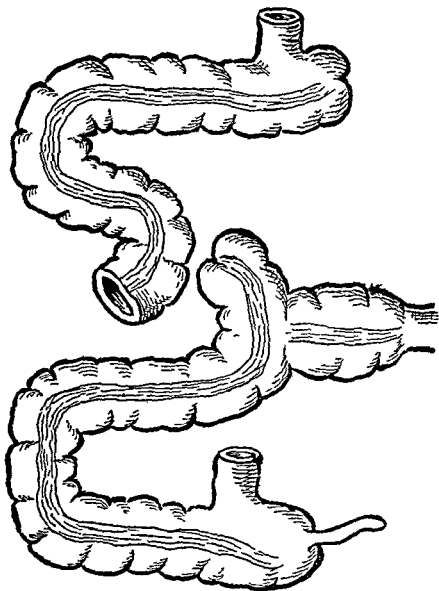


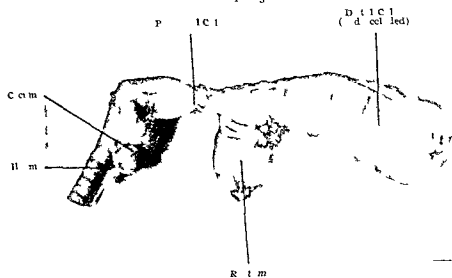
FIG.—Shows arrangement of the large intestine and its various loops and segments. The illustration shows the cecum, ascending colon, transverse colon, descending colon, sigmoid colon, and rectum. The long, coiled segment in the center represents a redundant loop of the colon.

continued improvement of the patient. In the meantime he went to his home in a neighboring city and resumed his business.

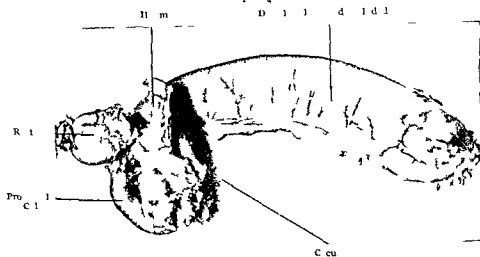
During the winter the trouble from accumulation in the blind end increased necessitating daily irrigations and finally, at the end of January, 1907, perforation at the blind end occurred with the formation of an abscess. This was opened at Atlantic City. After remaining there for some weeks, he was brought to New York with a narrow sinus discharging pus, gas and fecal matter. The discharge occurred more or less intermittently and at times would be accompanied by sharp colicky pain due to the peristaltic efforts of the loop to empty itself. The patient's general condition was bad, he had lost much weight and was running a low grade septic fever. By increasing the drainage his condition was improved and on April 15, 1907, ten months after the first operation, the transverse colon was divided just distal to the anastomosis with the pelvic colon, the proximal end was closed and the distal end brought up into the incision (Fig 2). The operation was exceedingly difficult on account of the adhesions. The loop now is a bilateral exclusion with a proximal opening, the distal end communicating with the skin by the fistulous tract. Water injected into the proximal end, escapes at once from the fistula but when injected into the fistula it does not escape from the proximal end, showing that it does not readily pass against peristalsis. Four months after the operation, the sinus communicating with the proximal end of the excluded loop barely admits a No 12 French catheter and there is no discharge from it. The distal end is also open and communicates with a fistulous tract leading to the point where the intestine was closed just beyond the anastomosis. The discharge being mingled with a small amount of feces escaping from the latter its character and amount cannot be determined. However, as far as can be ascertained, the excluded loop has contracted so that it will hold only about an ounce of fluid.

The necessity for anastomosing the pelvic into the transverse colon seldom occurs. An extended search of the rather voluminous literature of intestinal anastomosis and exclusion failed to reveal a similar instance. As a rule, obstructing growths of the sigmoid flexure do not involve an extent so great as not to permit of end to end union after resection. Not having data derived from former cases and anticipating

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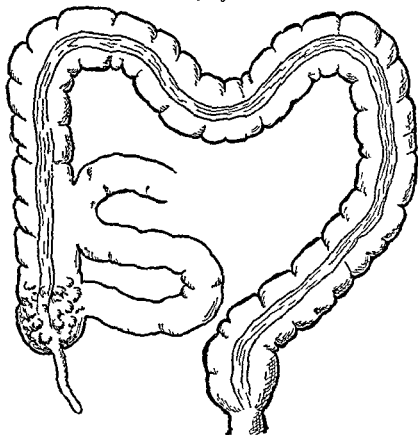
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trouble from accumulation in the distal blind segment similar operations were performed on dogs the large intestine being divided just above the rectum the oral end completely closed and the aboral end united end to side to the large intestine just distal to the ileocecal junction The first dog was operated on November 19 1906 and no adverse symptoms

F 5



Lat ral stom betw en th l m d ascend g l f th p rpos f h u g th  
t t l cont t by b tructi th m

excepting a temporary diarrhœa being noted the operation was repeated on another on February 7 1907 This dog also suffered from diarrhœa for several weeks after the operation On April 27 1907 both dogs were killed

Examination of the blind intestine beyond the anastomosis showed that the intestinal contents had been crowded toward



the closed end dilating it to more than twice its normal diameter Just beyond the anastomosis the diameter was practically normal which increased from there on to its maximum at the blind extremity (Figs 3 and 4) After a greater

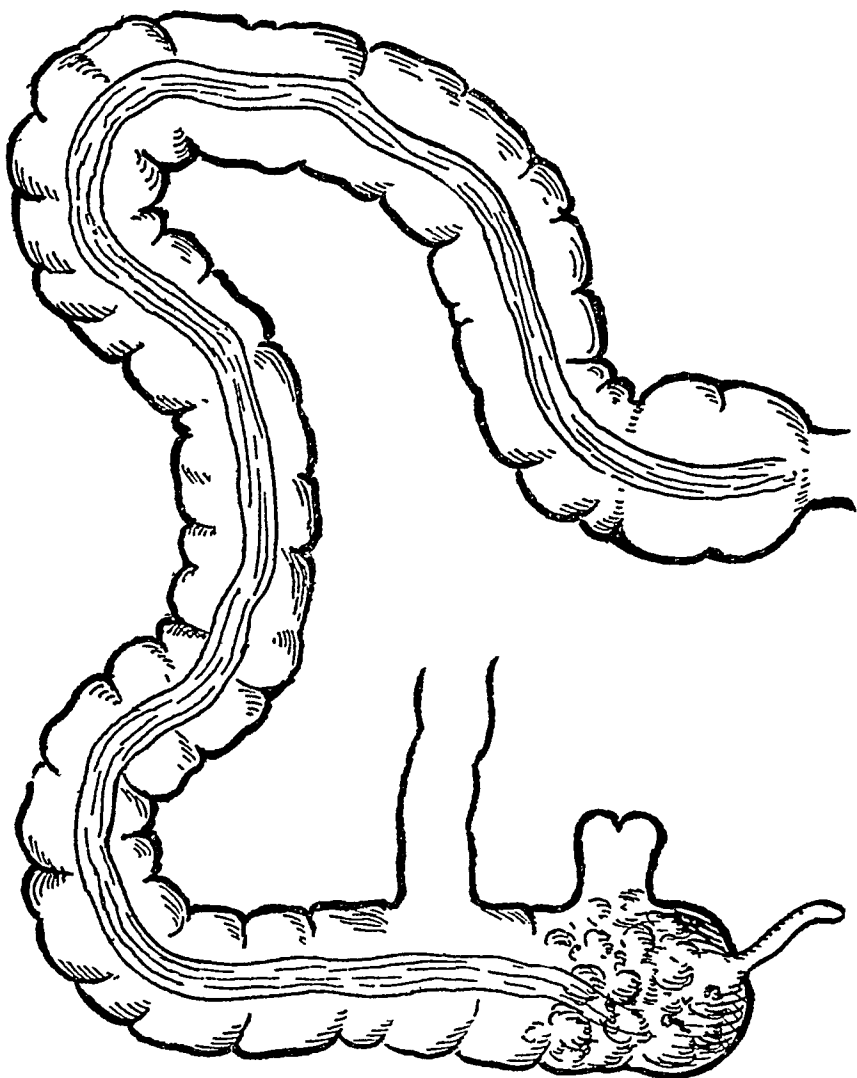
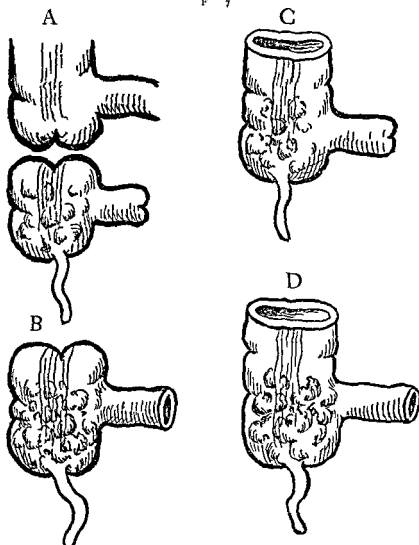


FIG 6—End to side implantation of ileum into ascending colon with occlusion of distal end of ileum The segment comprising the distal portion of the ileum and the cecum is unilaterally or incompletely excluded and is unilaterally occluded

lapse of time it is probable that perforation would have occurred in the dogs as it did in the man, either from ulceration or penetration by some foreign body accidentally ingested

The results of the operation upon the patient and the dogs show that aboral partial exclusion of the intestine is a faulty and dangerous procedure. If the excluded segment cannot be

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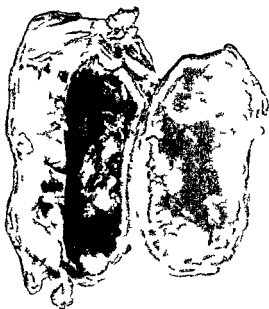
excised it should at least be totally excluded as was accomplished by the second operation in the case reported.

The objectionable features of such operations also apply to the ordinary lateral anastomosis performed to shunt the

intestinal contents by a diseased segment of gut. In such cases, if the obstruction is complete, accumulation occurs in that portion of the excluded loop which is proximal to the obstruction (Fig 5). This objection has been recognized for a long time although its dangers have not been fully appreciated. In cases of fistula or when, for any reason, the presence of feces in the excluded loop is objectionable, lateral anastomosis is a complete failure inasmuch as the feces are not prevented from passing into it. For these reasons the end to side anastomosis resulting in a unilateral exclusion as recommended by Senn, is preferable (Fig 6). Even when this operation is performed, fecal matter gathers to a certain extent, in the excluded segment on account of the double direction of the peristaltic movements in the large intestine, and if this is undesirable, complete exclusion as recommended by Salzer, should be performed, at least one end, preferably the distal, of the excluded loop being united to the skin (Fig 7).

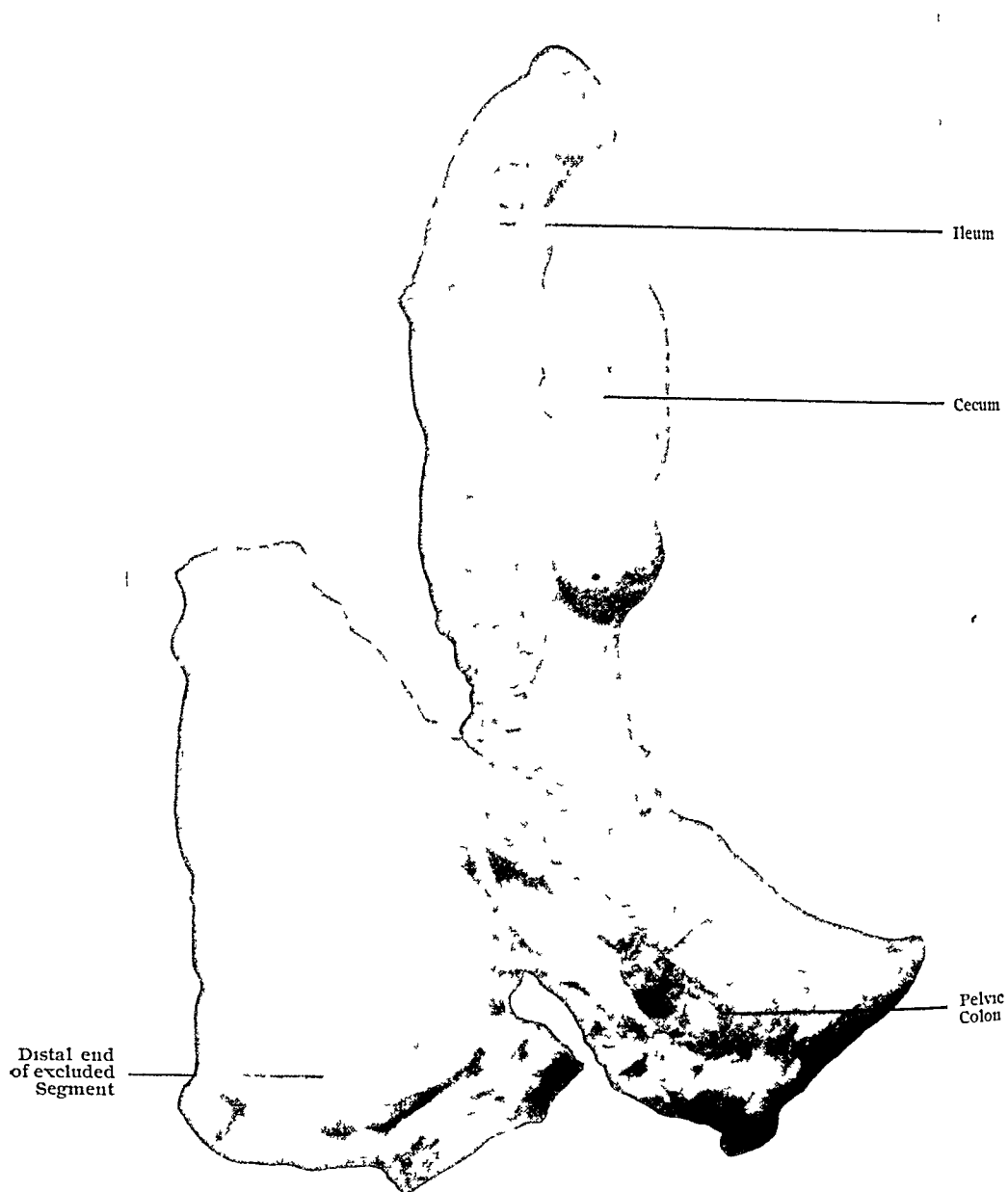
Unless one or both ends of a completely excluded loop communicate with the skin, or a communication exists by means of a fistula, troublesome accumulation is apt to occur. According to Reichel (*Centralblatt f Chirurgie*, Bd 22, S 37) in experiments on animals, accumulation may or may not occur. Obalinski states (*Centralblatt f Chirurgie*, Bd 22, S 129) that complete exclusion with total occlusion of the large intestine is safe but of the small intestine is dangerous on account of the preponderance of the secretory over the absorptive functions of the latter. According to Wiessinger (*Deutsche Zeitschrift f Chirurgie*, Br 62, S 1) only one of four cases of complete exclusion with total occlusion was successful up to 1901, either rupture occurring with fistulous formation or death.

In order to determine the safety of complete exclusion combined with total occlusion of the large intestine, a series of five experiments were made on dogs. Two of the animals died of peritonitis immediately following the operation and the identity of one was lost leaving only two in which the result could be observed. One of these was killed four weeks



Ph t g ph 3 nat 1 f pl t ly 1 ded d 1 d d la g t t

FIG 9



after the operation and the excluded segment was found to be distended with what was apparently fecal matter to three times its normal diameter (Fig 8) On section the walls were hypertrophic rather than thinned The other animal was killed three weeks after operation and the result is well shown in Fig 9 The photograph was taken one half hour after the removal of the specimen and shows peristaltic contractions still taking place in the excluded segment It is also interesting to note that the distal end is more distended than the proximal as a result of the peristalsis The result of these experiments indicates that total occlusion even of the large intestine is dangerous on account of distension of the segment by the excretions of the intestine They also indicate that distal occlusion has the same effect upon the excluded loop as any obstruction has upon the intestine in general namely in increasing peristalsis and causing hypertrophy of the muscularis

During the coming Winter further investigations will be carried out to ascertain the morphological and chemical nature of the semi solid matter found in the excluded intestine Its rapid accumulation is confirmatory of the theory that at least a large portion of the feces is excreted by the intestinal mucosa and that the function of the large intestine is not entirely absorptive

# ARE THE INTESTINES ABLE TO PROPEL THEIR CONTENTS IN AN ANTI-PERISTALTIC DIRECTION? \*

BY EDWIN BEER, M D ,

AND

CARL EGGERS, M D ,

OF NEW YORK

IN the following pages we wish to bring together some of the evidence in favor of an affirmative answer to the above query. The evidence in favor of such an anti-peristaltic movement is both clinical and experimental. How frequently under normal conditions such movements do occur in the human intestine remains to be determined by future investigation. Here we are concerned only with the question, can the intestines propel their contents in an anti-peristaltic direction?

That this question is not altogether simple is evident. That it is not settled will be readily gathered from the statements to be quoted from recent authoritative writers. In Wilms' book on Ileus just published (on p 26) he states, "An anti-peristalsis, that is, an evident upward peristalsis driving the contents of the bowel towards the pylorus, and not towards the anus, does not occur." On the other hand, W J Mayo, American Journal of the Medical Sciences, January, 1907 (p 4), states, "The normal action of the upper colon is anti-peristaltic except during defecation," and further, "Murphy has shown that salines introduced very slowly into the rectum will be absorbed with great rapidity, largely by reverse peristalsis to the cecum." These opposed views, recently expressed, show the need of further study along these lines, and we trust that the following array of evidence will convince

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\* From the Surgical Research Laboratory, College of Physicians and Surgeons, Columbia University. Presented in part at the New York Academy of Medicine, May, 1907.

many who at present agree with Wilms in his statement of the case

Before discussing the evidence gleaned from experiments in the laboratory and from observations in the clinic we must briefly analyze a phenomenon which in all probability does not concern this study. If some non absorbable powder such as carmine be placed within the rectum of a patient with a colostomy opening and smears be made from this artificial anus one will almost regularly find in a shorter or a longer time granules of this powder. In other words this carmine has wandered from the rectum up the bowel and out through the colostomy wound. This curious phenomenon can be observed by any one in such clinical material as above referred to or in laboratory animals if desired. At first blush it looks like an affirmative reply to the question before us for the contents of the rectum have wandered upwards in an anti peristaltic direction. Perhaps in due time this phenomenon may be adequately explained. At present almost all investigators are inclined to interpret this upward wandering of carmine from the rectum to the colon or even to the stomach or higher as due to upward currents along the intestinal wall quite independent of peristalsis. The fact that this phenomenon occurs despite stenoses of the bowel the carmine wandering through these rigid parts and the fact that intestinal quiet favors the ascent of the carmine seem to exclude this from the group of phenomena which point to the possibility of anti peristaltic activity in the intestine. The final verdict however has not been reached as yet.

Of direct bearing on the question before us are two groups of observations—the one gathered in the laboratory and the other in the clinic. Both are of great importance and both must be analyzed carefully. The experimental work is the more important as the observations are fuller and perhaps more accurate and these we shall take up first leaving clinical evidence for later consideration.

There are two experimental methods of approaching the problem as to whether the intestine is capable of propelling its



contents in the reversed or anastaltic direction, and in our work, which has been in progress almost  $1\frac{1}{2}$  years, we have employed only one of these, and that which seemed to promise most to us. Instead of employing the method of direct observation of the unoperated bowel, with or without the use of the X-rays we have used the operative or functional method of testing the capacity of the intestine for working in the reversed direction, by resecting segments in the small and large bowel, turning them around, and sewing them in place in reverse position. If the bowel is capable of propelling food in the reverse direction, then this reversed piece of intestine will function isoperistaltically, in other words its normal downward peristalsis will give way from time to time, or altogether to what would, under normal conditions, be anti-peristalsis. Thus we would acquire rather conclusive proof that the intestine is capable of doing anti-peristaltic work, of accomplishing what Wilms so recently denied.

This method of approaching our problem is by no means original, as in 1889, Kirstein attacked the question of anti-peristalsis in just this way. Since his publication many others have repeated his experiments (Mall, Edmunds and Balance, Muehsam, Kelling, Kauders, Enderlen and Hess, Prutz and Ellinger), but the lack of uniformity in results has occasioned considerable confusion.

Wilms' recent statement that, "in the experiments of Prutz and Ellinger, who have again carefully analyzed the anti-peristaltic intestinal movements, it is conclusively proven that the reversed segment shows the same peristalsis as before reversal, and that no real anti-peristalsis develops," fails to throw any light on this subject, in fact in our opinion, adds to the difficulties already existing. A brief review of the published work, and a careful analysis of Prutz and Ellinger's experiments will show, we believe, how erroneous Wilms' conclusion is.

In our opinion, the most satisfactory method of arriving at well-founded conclusions in these reversal experiments is by the direct study of the behavior of the reversed loops. That

is the only sure way of deciding in which direction the peristaltic waves progress. A second but less accurate and decidedly inferential method of arriving at valid conclusions is that in which reversals of extensive segments of the bowel are made. In such animals regular defecations must be the sign of downward or katastaltic waves as one cannot conceive of the intestinal contents traversing very large segments of reversed bowel towards the anus unless the peristaltic waves propel them in that direction.

With these two methods and view points in mind let us briefly review the work done along these lines and then take up our own experiments which were done in part by ourselves and in part by the students of the College of Physicians and Surgeons under the careful supervision of Dr. Maury.

*A. Kirstein*<sup>1</sup>—1889—operated on two dogs reversing segments of the small intestine. He attempted a direct study of the peristalsis in one of his animals but his attempt was unsuccessful. He noted at autopsy the animals being killed 7 weeks and 3 months respectively after the operation that at the upper anastomosis there was a spindle shaped dilatation with hypertrophy extending above and below the upper end to end anastomosis and bisected by this. This dilatation he explained as the result of the two peristaltic waves working against each other. He concluded with perfect propriety that the peristalsis in the reversed gut must be reversed at least from time to time to allow of the downward passage of intestinal contents through a reversed segment which was  $\frac{1}{4}$  of the length of the total small bowel as in his second experiment.

*Mall's* work was done about the same time as *Kirstein's*. He also found that at the upper anastomosis there regularly developed dilatation and hypertrophy and that in this spindle shaped area hard foreign bodies tended to collect though some glass balls fed to such an animal passed through the whole alimentary tract. Faradic stimulation (2 mos p op) in one

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Deutsch Medizinische Wochenschrift p 1000 1889

Johns Hopkins Hospital Reports p 93 1896

case in which he employed it, showed no reversal of the peristaltic waves

*F Kauders*<sup>3</sup>—1893—repeated these reversal experiments in cats, but failed to obtain any adequate results from his study of the peristalsis of the reversed loop, as only the circular muscle fibres contracted. He thought that Kirstein's conclusions were incorrect, that the bowel contents were squirted through the reversed loop which was passive. He made this more than bold criticism despite the fact that in Kirstein's case (No 2)  $\frac{1}{4}$  of the small gut was reversed. To imagine a force adequate to squirting food, etc., through  $\frac{1}{4}$  of the length of the small bowel, requires more than an ordinary effort.

*W Edmunds and C A Ballance*<sup>4</sup>—1896—repeated these reversal experiments, and though their work throws no light on the question of anti-peristalsis, they call attention to the fact that the reversed loop became shorter in their cases.

*G Kelling*<sup>5</sup>—1900—published one reversal operation in the uppermost jejunum. Three and one-third months after this operation he opened the animal's abdomen, and made a more or less satisfactory study of the peristalsis of the reversed loop. He incised the lower end of the loop, and saw the contents moved towards the rectum by distinct peristaltic waves! This animal was alive and well  $1\frac{1}{3}$  years after the operation.

*Muehsam*<sup>6</sup>—1900—contributed a great deal to this subject by bringing further evidence based on the second method of studying this problem—evidence along the same lines as Kirstein's, but perhaps more conclusive. He reversed practically all the small gut (430 cm out of 485 cm), and the animal lived 22 days, having occasional attacks of vomiting, and regular defecations. In the defecations, he recovered charcoal which had been fed by mouth 18 hours earlier. This unique case can in our opinion, be explained in only one way, by a reversal of the peristalsis in the reversed intestine.

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<sup>3</sup> Centralblatt f Physiologie, p 222, 1893

<sup>4</sup> Medico-Chirurgical Transactions, London, vol 76, 1896

<sup>5</sup> Langenbeck's Archiv, p 326, Bd 62, 1900

<sup>6</sup> Mittheilungen aus d Grenzgebieten d Medizin u Chirurgie, vol 6, 1900

(*Prutz and Ellinger* try to explain the phenomena here observed as the result of the action of the surface currents originally described by Grützner to which reference has been made above )

In 1901 *Enderlen and Hess*<sup>7</sup> experimented along these lines and in one case made a study of the peristalsis in the reversed loop By faradic stimulation a peristaltic wave was produced in the reversed direction from normal i.e. the peristaltic wave was reversed in the reversed loop

In 1902 *Prutz and Ellinger*<sup>8</sup> reviewed the whole subject and did further experimental work along the same lines In one case they observed the peristalsis in the reversed loop 31 days after the operation and found that it was not reversed They admit however that occasionally anti peristaltic (reversed) waves were seen in the reversed and in the non reversed bowel In all their 12 experiments this is the only observation or study of the peristalsis of the reversed loop They however attempted to determine by other means " which direction the peristaltic wave progressed By producing a stenosis in the lower part of the reversed loop and noting on which side of this dilatation developed they thought they could discover the direction of the wave Thus if the peristalsis were reversed dilatation would occur above the stenosis if not reversed dilatation would develop below the artificial stenosis In 2 cases they obtained results which they interpret as showing no reversal of the peristaltic wave In our opinion they have gone beyond the data which they have published and to us it seems as if their conclusion was not only unwarranted but in view of the fact that the dilatation above the artificial stenoses was regularly much greater than that below a conclusion the direct opposite of theirs seems justifiable

This brief review shows how at variance the different results are Most of the experimentors failed to study the peristalsis in the reversed loop Some attempted such a study but invariably only in one case This most conclusive method of

deciding the problem before us has been signally neglected. The second method of investigating this question, Kirstein and Muehsam used successfully by making very extensive reversals.

In our work done on dogs, some 20 experiments in all, we employed both methods of investigation, and our results will be grouped according to the method employed. We operated in the usual way, cutting out a segment of small gut or large gut and then reversing it. The anastomoses were either end to end, or lateral. The latter was preferable when very large segments were reversed, as there was apparently, less direct tension on the suture line by opposed peristaltic waves, and consequently less chance of leakage. No matter how carefully the operation was done, leakage and separation at the upper anastomosis would occasionally develop so that we were inclined to conclude that the bowels of different dogs varied in their irritability, and perhaps in their muscular strength to such a degree that the technique that was adequate for one might prove inadequate for another, when the opposing and perhaps obstructive peristaltic waves caused undue pressure against the upper anastomosis. At the lower anastomosis, such leakage was most exceptional despite the fact that the direction of the peristaltic waves was probably in opposite directions, *i e*, tugging at the anastomosis.

In all animals that survived the operation, we did not make studies in peristalsis, as we were interested in other problems connected with this work, and did not wish to sacrifice all to this study. In the following pages we trust, however, we have sufficient data to warrant the standpoint we have taken.

*SERIES I—Direct Inspection of Reversed Loop—Small Intestine Reversals*

No 84—Spaniel operated March 15, '06. Median abdominal incision. Reversal of about 15 inches of lower ileum and lateral anastomoses in reversed position, to the bowel above and below lines of section.

March 20. After primary indisposition animal recuperated on diet of milk and biscuits.

May 20. Defecates regularly (practically daily, careful note of this being made every day). Animal began to do poorly.

June 9 Eleven weeks after the reversal a study of the peristalsis was made under ether the intestines being well protected by very frequent use of warm saline solution hot towels etc The peristaltic waves were stimulated in a variety of ways mechanical chemical and thermal stimuli being employed in the different experiments

*Observation*—The peristaltic wave in the reversed loop was very clearly in the same direction as that of the rest of the small bowel Peristaltic waves that began above upper anastomosis traveled into the reversed loop and then down this across the lower anastomosis Peristaltic waves which began in the reversed loop traveled to a slight extent upward but in the main they traveled downward and then frequently across the lower anastomosis

*Autopsy* showed in addition to some adhesions which produced slight kinking of the bowel well marked dilatation and some hypertrophy of the lower end of the gut above the upper lateral anastomosis The reversed piece was very slightly dilated and contained two large fecal masses

No 41—Fox terrier had been frequently operated i.e gastroenterostomy gastrotomy before reversal was done

March 8 After breaking up a lot of adhesions 24 inches of lower ileum were reversed and united to the rest of the bowel by end to end anastomoses

April 1 Animal except for occasional vomiting did fairly well By adding milk to his biscuit diet his condition was improved Defecates regularly

April 4 Six weeks and five days after the reversal the abdomen was opened to study the peristalsis as in the previous case. The exposure was difficult because of adhesions

*Observation*—The bowel proximal to the upper end to end anastomosis was found markedly dilated and hypertrophied for 6-8 inches The upper part of the reversed gut for 12 inches was similarly changed The rest of the reversed bowel—the lower anastomosis and the bowel below were unchanged. The reversed loop was empty whereas the parts adjacent to the upper anastomosis were full of intestinal contents In studying the peristaltic waves great difficulty was met with in determining which way they progressed Above the upper anastomosis the wave was peristaltic i.e in the normal direction while in the reversed loop mechanical stimulation as well as heat evoked once a peristalsis in one direction and at another time in the opposite direction. In the lower part of the reversed loop the direction of the peristaltic wave was more distinctly downward Abdomen closed

May 12 Nine weeks and two days after reversal abdomen again opened for peristaltic study

*Observation*—After separating adhesions in abdomen we attempted to stimulate peristalsis without any further manipulation of the bowel Croton oil was injected into the lumen without results local application of salt produced only local circular contractions Hot saline solution produced well marked peristaltic waves which could be seen beginning above the upper anastomosis traveling across this anastomosis and con

tinuing down the reversed gut. In this loop the circular muscle contractions were well marked. The progression of the peristaltic waves were distinctly from upper to lower anastomosis. The bowel was almost empty. Animal killed.

No 90 Pug. On March 22d between 12 and 15 inches of lower ileum were reversed and end to end anastomoses (Maunsell method) were made. The dog was carefully fed on milk, meat and biscuits so that he might continue in good health for a long time.

October 23. Seven months after the reversal the abdomen was opened.

*Observation*—There was marked dilatation above upper union for at least 15 inches. This piece of bowel was also hypertrophied. In the region of the upper anastomosis there was an accumulation of stones. The reversed loop was slightly dilated and markedly hypertrophied. The peristaltic waves were distinctly downward in the reversed loop.

#### SERIES II—*Colon Reversals*

No 76—On March 10, 1906, as much of the ascending colon as could be liberated—about 6 inches—was resected and reversed and then reunited by end to end anastomoses to the rest of the bowel. This case did well on the selected diet.

January 4, 1907. Almost ten months after operation the abdomen was opened and a study of the peristalsis was made.

*Observation*—The reversed loop was dilated and hypertrophied. The peristaltic waves descend from the ileum across the upper anastomosis and then descend through the reversed loop, but stop at the lower anastomosis. Circular contractions follow each other in the reversed loop, in the same direction as the composite peristaltic wave. The reversed bowel contains foreign bodies.

These observations of the behaviour of the reversed loops leave no doubt in our minds that the small and the large bowels are capable of propelling food in an anti-peristaltic direction. It would appear that the bowel has a distinct power to work in an anti-peristaltic direction and moreover that this power is capable of extensive development. Early in the life of the reversed loop, there seem to be ana- and kata-staltic waves, later on the kata-staltic (which are anti-peristaltic with reference to the original normal bowel) seem to predominate. We are inclined to agree with Kirstein, that in the reversed loop, the peristaltic waves vary in direction, especially at an early stage in the life of the reversed loop, and that is well shown by Case 41, at the first study of peristalsis. Prutz and Ellinger's observation of anti-peristaltic alternating with isoperistaltic waves in their one case, seems to us to fit into this view.

of the matter. Perhaps Mall's observation will bear a similar interpretation which harmonizes the divergent results summarized above. To what extent the reversed bowel moves katectically with abdomen closed we can not say as yet.

Just why a more or less spindle shaped dilatation develops at the upper union is not very clear to us. At first one would jump at the explanation usually offered—that there is an obstruction due to opposed peristaltic waves and that leads to dilatation and hypertrophy at this point.<sup>9</sup>

That some truth is contained in this explanation in view of the fact that foreign bodies tend to collect in the lumen at this point and in view of the observation made by Cannon and Murphy mentioned further on we can not doubt though we feel sure it is not the complete explanation as the same obstruction would we think be manifested throughout the length of the reversed loop still the loop as a whole does not dilate and hypertrophy.<sup>10</sup>

If we now turn our attention to the second or inferential method: the reversal of very big segments of the bowel we find that with reversal of the whole jejunum and ileum most animals die of a perforative peritonitis due to leakage at the upper union. Those animals that live long enough to be of any value behave much as Muehsam's case defecating repeatedly after the first day or two without any marked vomiting. These animals probably because of the great change in the intestinal chemistry digestion and absorption being rudely interfered with die very suddenly. For instance one animal thus operated on did well in every respect for five days and then died suddenly without any definite gross lesions to demonstrate the cause. Another died suddenly 10 days after operation a few hours after receiving a good dose ( $\frac{1}{2}$  ounce) of castor oil. This animal at autopsy had a fresh invagination at the lower anastomosis which occluded the bowel.

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The fact that this dilatation develops very early lends support to this view.

<sup>10</sup>The colon may behave differently from the small intestine—the whole loop apparently dilates and hypertrophies here.



But it is not necessary to rely on such extreme cases alone. It is sufficient to reverse some 15-24 inches, as we did in a large number of cases. For it is inconceivable that an animal can defecate regularly, if such a length of reversed bowel does not, at least from time to time, function kata-staltically. In the cases quoted above, such resections have been made and the animals lived in fairly good health and defecated practically every day, provided they were carefully fed. To cite further cases, from our lists, of prolonged life with regular bowel activity after such reversals would not be of any value. We regret that we could not duplicate Muehsam's case and keep an animal, with reversal of all the small intestine, alive for over three weeks.

Thus both groups of observations point to the conclusion that the intestines both large and small, are able to propel their contents in an anti-peristaltic direction.

Further evidence of the truth of this conclusion is furnished by the excellent observations of Cannon and Murphy,<sup>11</sup> who observed anti-peristalsis in the duodenum, a portion of the intestine that we could not experiment on. In a reversal experiment, where the jejunum was reversed close to the duodenum, they repeatedly saw, 6 days after operation, with the aid of the X-ray, that food left the pylorus and descended to the upper anastomosis and then was in part rapidly moved back again towards the pylorus. This unique observation makes it equally clear that there is a more or less marked obstructive condition at the upper anastomosis in these reversal experiments.

Cannon's earlier work on the peristalsis of the ascending colon of cats, shows without a doubt that Jacobi's<sup>12</sup> observation of anti-peristalsis in this part of the bowel (and in lower ileum in colchicin poisoning) was well founded. Here it would seem that this is a normal process,<sup>13</sup> whereas our ex-

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<sup>11</sup> ANNALS OF SURGERY, 1906

<sup>12</sup> Archiv f. Exp. Pathologie u. Pharmakologie, vol. xxvii, 1890

<sup>13</sup> Except in dogs. T. R. Elliott and E. Barclay Smith, Journal of Physiology, xxxi, 1904, p. 273

periments do not take us that far any more than those well known experiments of Nothnagel in which he produced anti peristalsis in the bowels by abnormal stimuli such as injections of concentrated salt solution

In addition to all this experimental evidence we dare not disregard the clinical evidence which so frequently has to be taken with a grain of salt In this paper we shall not go into this matter in any great detail as our main object was to present our experimental results still for completeness sake we must briefly mention the clinical evidence in favor of an affirmative answer to our postulated query at the head of this paper

Fecal vomiting in intestinal obstruction and the vomiting of fecal masses and enemata in so called hysterical patients excluding of course actual cases of fraud can be most readily explained by this ability of the bowel especially marked under abnormal stimuli of propelling their contents in an anastaltic or antiperistaltic direction

These two types of fecal vomiting must be distinctly separated as the former is explicable in several ways whereas the latter in our opinion is subject to but one explanation In the vomiting of intestinal obstruction the fluid contents of the bowel may be squeezed out of the bowel into the stomach thence to the outer world by the pressure exerted by the forceful contractions of the abdominal muscles—anti peristalsis may have nothing to do with it Cannon and Murphy's observation above referred to makes us believe however that anti peristalsis is an important factor in this process the more so as all of the bowel above an obstruction is not regularly well filled at autopsy of ileus cases as the explanation based on hydrodynamics would demand It appears to us therefore that both forces work together in producing this symptom

The vomiting of formed feces and the vomiting of enemata a few minutes after introduction into a normal alimentary tract as reported by Treves Langmann<sup>14</sup> and others

cannot be explained by anything short of a most active anti-peristalsis of the whole bowel. In this we consider Nothnagel's verdict final, despite Wilms' recently expressed scepticism. The former says in his discussion of those cases, so called hysterical ileus cases, "that in no other way can this vomiting be effected than by well marked, in part even very active anti-peristalsis of the intestine."

# RECTAL ANÆSTHESIA EXPERIMENTAL STUDIES TOGETHER WITH A REPORT OF ITS PRAC TICAL EMPLOYMENT AT ROOSEVELT HOS PITAL

BY NOEL BLEECKER LEGGETT M D

OF NEW YORK.

ETHERIZATION by rectum is by no means a new departure for at different times in the past sixty years methods have been sought whereby a patient might be anæsthetized by this method Perigoff in his book on etherization published in 1847 mentions it At the same time Roux in the *Journal de l'Academie des Sciences* refers to the possible utility of rectal anæsthesia Marc Duprey employed ether pure or mixed with water as an injection for the purpose of producing anæsthesia Malliere in 1884 used ether vapor obtained by boiling ether and letting the expanding gas force itself into the rectum In the same year Hunter reported six favorable cases He praised the method but did not mention any after effects Weir (*N Y Med Rec.* 1884 XXV p 507) gives seven cases reported by Dr W T Bull all of which had bloody stools following this method besides two cases of his own one of which ended disastrously

Wanscher in the same year 1884 records 22 cases of anæsthesia induced by injecting ether vapor into the rectum. All of his cases were favorable except one in which he was unable to produce narcosis due to the presence of feces in the colon But the next day after the colon was thoroughly cleaned out the patient was readily anæsthetized This shows the importance of having the lower bowel fully prepared before attempting narcosis (*Congress Med Sciences* 1884 p 186 Sec 1) Post reports three cases with no vomiting or diarrhœa (*Boston Med & Surg Jour* 1884 CX p 442) Bux

ton used this method and advocated its use for operations on the head, neck and for empyema <sup>1</sup>

The method then lay idle from 1898 until two or three years ago when J H Cunningham of Boston again brought it before the public. He presented forty odd cases, all of which pointed to the practicability of rectal anæsthesia, if properly administered. Reading Dr Cunningham's paper in the Boston Medical and Surgical Journal, it seemed, in view of his results with improved technic, that rectal anæsthesia had not had a full and fair trial in this city.

The method originally employed was that of boiling the ether in a vessel and allowing the expanding vapor to force itself into the rectum. In this way the vapor entered the rectum in such volume that there was a condensation in the tubes. Liquid ether was consequently forced into the gut, causing extreme irritation, ulceration and hemorrhagic proctitis.

Cunningham's method is somewhat similar, yet it varies in one vital point. The vapor of ether is forced into the rectum in such a way that there is no condensation, and absorption takes place with such rapidity that it is not possible for fluid ether to be forced into the gut. This is done by keeping the ether heated, yet constantly below 37° C which is its boiling point, and forcing the fumes into the bowel by means of a rubber hand bulb. Herein lies the essential difference between the new technic and the old.

The apparatus is demonstrated in the accompanying cut. The effect upon the patient is as follows. He reclines in dorsal position with legs slightly flexed. The rectal tube is inserted 8 to 12 inches. Ether fumes are then slowly forced into the rectum. They cause a sensation of fullness so that the patient may have a desire to defecate. This is overcome by opening the exhaust tube at K and allowing the gases which are in the

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<sup>1</sup>In 1898 S J Meltzer used ether by filling a bottle half full and placing it in a water-bath at a temperature above that of the rectum hot enough to boil the ether. He noted that ether is apparently more completely excreted when given by rectum than by the lungs.



advantageous this method will be in cases of tuberculous pulmonary involvement

Our post operative observations upon the patient may now be considered. The nausea, which in the inhalation method is still present despite many technical improvements is greatly decreased and in many cases absent after rectal anaesthesia

So far I have given rectal anaesthesia in human beings in 13 cases only. We have, however, employed it upon dogs during a considerable period of experimentation. In these animals, it produces no proctitis, and if the fumes are allowed to pass the ileo-cecal valve, complete narcosis may be maintained for any length of time. Dogs have too short a colon to lend themselves favorably to this study. Through the kindness and interest of the attending staff of Roosevelt Hospital, I have had the privilege of using this method on the following cases

CASE NO 1 —It was one of cervical adenitis on Dr Blake's service, operated upon by Dr Martin, a boy, fourteen years old. Ether was started by the rectal method and in twelve minutes he became very heavy and drowsy, having had no discomfort whatsoever. After this, the patient muttered incoherently for a short time, then became quiet in 20 minutes after the ether was started and in 30 minutes there was absolute narcosis. The patient was under ether for 45 minutes during the operation, 85 minutes in all. The respirations were regular and full and there was none of the harsh rattling breathing due to bronchial secretions. The color was unusually good throughout the operation, and the blood was at all times well oxygenated. The patient made a rapid ether recovery, vomited once and had no rectal symptoms at all. Dr Martin thought the blood did not coagulate as rapidly as usual.

CASE NO II —Dr Blake's service. Operated on by Dr Martin—tubercular rib. This patient had tubercular conditions in other parts of the body. Had taken ether several times previously. Ether was started by rectum and in ten minutes the patient was drowsy, although he complained a good deal at the length of time consumed. In twenty minutes, he was completely

anesthetized Breathing was regular pulse good and strong showing the stimulus of the ether Patient was under ether anæsthesia for thirty minutes in all He made a quick recovery and had no rectal symptoms He complained simply of the length of time taken in producing sleep Said the method was free from pain

CASE No III—Sacculated empyema Operated upon by Dr Blake Anæsthesia was commenced both by inhalation and rectum the patient being anesthetized in five minutes then the ether continued by rectum during the operation which lasted twenty minutes The breathing was full and regular color perfect and pulse all that could be desired Rapid ether recovery with no rectal symptoms of any kind

CASE No IV—Sarcoma of frontal sinus Operated upon by Dr Blake Patient had had ether twice previous to this Ether was started by mouth and rectum and in ten minutes the patient was completely anæsthetized when the inhalation was discontinued but ether continued by rectum The patient began to come out before reaching the table so inhalations were again given till complete narcosis was again obtained when it was discontinued The patient again came out and anesthesia by mouth was continued for the rest of the operation This case was one in which the rectal method was not effectual It demonstrated however with the preceding that the ether vapor has no ill effect upon the mucous membrane of the colon for the patient came through with no colic or other untoward symptoms

CASE No V—Dr Blake's service Dr Martin operating Cervical adenitis Rectal ether started and given for ten minutes when patient became drowsy The operator being ready ether was given by mouth till the patient was anæsthetized then anesthesia continued by rectum for one hour The patient was in perfect condition throughout the whole of this time made a good quick ether recovery with little vomiting and no rectal symptoms

CASE No VI—Epulis Dr Martin operating on Dr Blake's service Ether began 12 15 by mouth and rectum Patient under in five minutes when ether was continued by rectum for twenty five minutes Recovery with very little vomiting and no colon nor rectal symptoms

CASE No VII—Hydrocephalus in a child three years old



Operated upon by Dr Brewer Child was anæsthetized by mouth and rectum and then anæsthesia continued by rectum Patient lost sensation in three minutes The ether was continued for fifty minutes in all At one time stimulants had to be given due to the shock of the operation as much as to any effect of the ether, if not wholly so The child's ether recovery was rapid with some vomiting, but absolutely without any rectal irritation

CASE No VIII—Axillary Carcinoma Operated upon by Dr Blake Ether was started by mouth and rectum The woman was fully anæsthetized in a few minutes Patient defecated while going under As soon as inhalation was stopped, patient began to come out of ether, and it had to be continued by mouth The patient defecated several times, at last clogging rectal tube, so ether had to be stopped by rectum Colon had not been adequately cleaned

This case shows that it is most necessary to have the bowel fully cleaned before the patient can absorb the ether rapidly enough to keep up complete narcosis

CASE No IX—Dr Martin Cervical Adenitis Child—girl 5 years Ether started by mouth and rectum Patient anæsthetized in 3 minutes Patient was under ether 30 minutes The rectum being partially filled, it was difficult to regulate the anæsthesia Patient defecated twice Rapid recovery Very little vomiting

CASE No X—Dr Blake Cervical Adenitis—boy 16 years Ether started by mouth and rectum Patient anæsthetized fully in 5 minutes Then ether continued per rectum Patient under 30 minutes No bronchial secretions Patient at first was hard to control but in a short time was fully in a lax and narcosed condition Patient made rapid ether recovery with no vomiting and no rectal distress

CASE No XI—Dr Brewer Tubercular Laryngitis Adult 3 15 Morphine Sulphate, gr  $\frac{1}{4}$  given by hypo

3 30 Ether by mouth and rectum Ether continued by rectum 65 minutes, respiration, full, strong and regular, the pulse good

Patient recovered from the ether rapidly with no rectal distress, and very little nausea or vomiting

CASE No XII—Dr Brewer Carcinoma of Face Ether

commenced by mouth and rectum and continued by rectum alone for 20 minutes. Rapid and easily recovery.

CASE No VIII—Dr Flint. Epithelioma of Lower Maxilla. Resection of Maxilla. Ether started 2 15 P M. Patient on the operating table 2 35 when ether was continued by rectum until 3 20. Color of patient good. pulse slightly rapid. no condition of shock. Rapid ether recovery with very greatly decreased nausea and vomiting.

These cases though few show in a small way the possibilities which this method of etherization offers both to patient and to operator.

Rectal anæsthesia may thus be summed up from two stand points viz from that of the patient and from that of the operator.

The lessening of nausea the lessening of irritation to the lungs and the lessening of the bronchial secretions which were nearly entirely absent in most of the cases are certainly all in themselves favorable. Furthermore a fully and continuously clear field of action in all operations about the head and neck saving time and loss of blood and above all lessening the chance of infection from an ether cone are all points in favor of the method which must appeal to every operating surgeon.

The chief points about the apparatus which we believe to be new and useful are first the introduction of the Y and exhaust tube to empty rectum and second the glass U tubes which enable one to be certain that no liquid ether is passing into the rectum. It is a convenience and a safeguard for the anæsthetist to be able to empty the rectum of gas or of ether vapor at a moment's notice.

Since sending the above to the publisher I have had the good fortune to collect through the kindness of Dr W S Sutton of the Roosevelt staff eighteen additional records of the use of rectal anæsthesia at the hospital. This makes a total of thirty one (31) cases.

Two of these recent records deserve particular attention.

In the first case the patient was markedly alcoholic and therefore a large ether consumer. After ether recovery he had one small rectal hemorrhage. The cause of this is unknown. All succeeding movements were blood-free.

In the second case, Dr Chas H Reck operated for the removal of an enlarged thyroid. He was struck by the advantages offered by rectal anæsthesia in this class of cases and believed that under favorable conditions it might in time supplant the slower method of cocaine infiltration.

A large number of suitable cases are now being anæsthetized by the rectal method at Roosevelt Hospital, and when Sutton's conclusions are published we shall know quite positively the advantages accruing from Cunningham's new technic.

# TUBERCULINS AND THE TUBERCULO OPSONIC INDEX \*

BY THEODORE DUNHAM MD

OF NEW YORK.

THE present paper is in no sense a review of the work done and results achieved in this interesting field. My aim is to present the subject to you as it has presented itself to me. I shall be thoroughly practical and shall discuss chiefly the method of determining the tuberculo-opsonic index as I am practising it and the tuberculins.

In the *Deutsche medizinische Wochenschrift* for April 1 1897 Koch described his improved tuberculin. He told in what way the old tuberculin had disappointed that repeated injections of it were followed by repeated improvements but that these improvements had a limit for an immunity was established against the tuberculin itself. This immunity may last several months. This immunity has no influence on the tubercle bacilli it is therefore purely a toxin immunity not a bacterial one. The power to react was unfortunately often lost before a complete cure was established. A return of this power of reaction had to be awaited before the treatment could be continued. Where however sufficient patience and skill were exercised many cases might be cured and he would still have felt that in the old tuberculin we had the best remedy for tuberculosis if it had not proved possible from tubercle cultures to make a pure bacterial immunizing preparation. This to be brief he prepared as follows. The tubercle bacilli from young virulent cultures were desiccated in vacuo ground to pieces in a mortar taken up in distilled water and the mixture centrifugalized. There resulted an upper slightly opalescent fluid and a sticky sediment. The sediment was dried and put through the above process again. The resulting sediment

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\* Read before the New York Surgical Society May 8, 1907

was again treated in the same way, and so on until only incidental dirt remained as a sediment. The first supernatant nearly clear fluid he called Tuberculin O (oberste Schicht), or, for short, TO. This he found had properties very like those of the old tuberculin. The subsequent fluids resulting from the grinding and other manipulations of the successive sediments were mixed together and named Tuberculin R (Rests), or, for short, TR. It was so made that 1 c.c. contained 10 mg. of solid substance. This solid consisted of pulverized tubercle bacilli minus certain elements which had been extracted and were contained in the TO. A peculiarity of TR which distinguished it from the old tuberculin and from TO was that its injection was to a far less degree followed by a temperature reaction. Koch regarded this as a distinct advantage possessed by TR over TO and old tuberculin. Koch began with injections of  $\frac{1}{500}$  mg. of TR and gradually raised the dose to usually 20 mg. These figures refer to the solid substance in the TR. Secondary symptoms to cause anxiety, or any other encroachments on health which could be ascribed to the preparation, Koch said he saw in no case. Especially striking was the progressive straightening out and return to normal of the temperature curve. He said he did not venture to maintain that the method of beginning with minimal injections and gradually raising them to 20 mg. was the best way of using TR. He thought other methods of procedure, perhaps even combinations of TR with TO or with sera obtained with TO or TR might be found to be more effective. But further improvement in the matter of preparations made from tubercle cultures he did not think was to be looked for.

Another important communication from Koch appears in the same periodical under date of November 28, 1901. The subject of agglutination of the tubercle bacillus by sera of patients had come up. Koch made an exhaustive study of it. Before this there had been no means of measuring the degree of immunity attained. Koch came to the conclusion that the agglutination test gave this needed measure. In earlier immunizing attempts he had given to TR the preference over

TO because TR gave relatively weaker reactions than TO. But guided by the agglutination test he now found it better to use the undivided culture mass and further that the agglutinating power in man as well as in animals developed most surely and quickly when the reactions were not too feeble and when the doses were raised as rapidly as possible. He made a new tuberculin containing one part of pulverized tubercle bacilli in 100 parts each of water and glycerine. One c.c. thus represents 5 mg. He began with injections of 0.0025 mg and rapidly increased the dose. He found that when agglutination had set in or when that originally present had been increased it was important to continue raising the dose otherwise the agglutinating power would sink. He went as high as 20 mg and in some cases 30 mg. That the development of agglutinating power is actually associated with the formation of protective substances he felt could be inferred because from the moment that agglutination was established in his phthisis cases the condition of the patients was distinctly better. Some patients failed to develop agglutination and in them of course the agglutination test could not be used to control the treatment. The preparation which Koch used for his injections is known as New Tuberculin Koch (*Bacilli Emulsion*). Both it and TR which is now labelled New Tuberculin Koch (TR) are manufactured by the Farbwerke vorm Meister Lucius and Bruning and are imported into this country by their agents Victor Koechl and Co 122 Hudson Street New York.

Koch felt that the agglutination test gave him a measure of the degree of immunity which his tuberculin was producing. Wright believes he has discovered a better measure in the opsonic index. He infers from experiments that there are substances in the blood which act upon bacteria to make them easier victims for the phagocytic leukocytes. These substances he calls opsonins. There are apparently various opsonins for the various microorganisms. The proportion of opsonin in the blood Wright takes to be the measure if not the reality of the immunity. The relative amounts of opsonin in the blood of a healthy individual and in that of a patient are determined

by observing the phagocytic powers of leukocytes when in the presence of bacteria acted upon by the serum of the patient, and their phagocytic powers when the bacteria are acted upon by the serum of a healthy individual. The average number of bacteria found in a polynuclear leukocyte in the case of the patient's serum, divided by the average number found in the case of the healthy individual's serum, is the opsonic index of the patient. It is expressed in decimals for convenience of comparing various indices.

I have chiefly concerned myself with the tubercular index. In spite of reading the contributions of Wright, I have found this work difficult. Dr. Simon Flexner has saved me much preliminary stumbling by showing me the opsonic work which Dr. Edwin H. Shorer has been engaged in at the Rockefeller Institute. I am deeply indebted to Dr. Flexner and Dr. Shorer for introducing me to the practical details of opsonic technique.

As the communications of Wright are accessible to all, I shall not take your time to describe the mode of determining the tuberculo-opsonic index in all its many details, but shall confine myself to speaking of the snags which I have encountered and the ways in which I have put them aside. The three ingredients for determining the phagocytosis are the serum, the mixture containing the leukocytes, and the suspension of tubercle bacilli. There is no trouble about getting the serum. The only point about the leukocytes is to centrifugalize them at such a slow rate that they shall not be pressed together into coherent clusters, but shall remain discrete. I find that if the centrifuge runs at 900 revolutions for half an hour the result is perfect. There is more trouble about the suspension of tubercle bacilli. For making this I have used the coarse powder of agglomerated bacilli which is a by-product in the manufacture of tuberculin. The method of grinding this in a mortar results in a considerable fragmentation of bacilli, which adds somewhat to the difficulty of counting accurately, and the grinding is tedious. I have discarded the mortar and have made a shaking machine which I use instead. It contains a mill-wheel run by water from an ordinary faucet. To the wheel-shaft is

attached a crank and to the crank a rod the further end of which plays through a bearing about 14 inches distant. To this rod is attached a trough into which the object to be shaken is snugly packed in cotton and firmly tied. The stroke is 2 inches and the crank makes about 400 revolutions a minute. I put some of the bacilli powder some glass beads and the suspension fluid into a glass tube and seal the tube. I put this tube in the shaker turn on the water and let the machine run six or eight hours. Individual bacilli become disengaged in abundance and there are few fragments. I then fill a tube for two inches with the opaque shaken mixture and centrifugalize it at about 3000 revolutions for six minutes after which the top half inch is aspirated off. This fluid may contain too many bacilli in which case the proper dilution is made.

Another difficulty I have found in getting the smears well stained for counting purposes. There are three desiderata. The bacilli should be intensely stained so as to be seen with the least effort. The nuclei should be lightly stained so that bacilli overlying them are readily seen. The outlines of the leukocytes should be visible.

I have struggled much over this matter and have arrived at the following staining method. Fix 20 seconds in wood alcohol. Wash. Stain 5 to 10 minutes in a bath of carbol fuchsin standing in boiling water. (I have made the carbol fuchsin of double strength 20 parts sat alc sol fuchsin to 80 parts 5 per cent carbolic acid and evaporated it down on a water bath until it was of sufficient strength to make a good reddening of the smear in 5 minutes.) Wash. Decolorize one minute in 5 per cent.  $H_2SO_4$ . Wash. Counterstain 30 seconds in  $\frac{1}{4}$  per cent. sat alc sol methylene blue in  $\frac{1}{2}$  per cent sol  $Na CO_3$ . Wash lightly. Dry by agitation in the air. If the smears are good the pictures are also good.

I wish I felt justified in saying something about results of treating cases of surgical tuberculosis under control of the opsonic index. I have encountered so many difficulties in the technique that my energies have thus far been mostly absorbed in trying to overcome these. In this field it is folly to make



clinical deductions until one is sure of getting indices of fairly uniform accuracy. As the sera of patients are supposed to vary widely without treatment and to fluctuate under the influence of treatment, the accuracy of the determination can best be gauged, it seems to me, by including in each batch of sera to be opsonized, the sera from more than one normal individual. These normal sera serve as opsonic standards in the same way that a pasted serum does, and in addition they serve as mutual controls upon the accuracy of the work. If the indices of the normal sera are not in accord, suspicion is cast upon the results in the whole series. I have adopted this method of control, using my own serum and those of my two sons. My results are as yet too few to warrant definite conclusions as to the accuracy of the technique or the value of the tubercular index, but my experience makes me feel that the results obtained by anyone who has not thus controlled his work until quite sure of his ground are to be received with scepticism.

Wright has used for his injections Koch's TR, and has generally begun with a dose of  $\frac{1}{1000}$  mg. He has usually found that the index could be kept highest by using very small doses, rarely going higher than twice or three times this amount. In the matter of dosage he is thus at great variance with the conclusions reached by Koch when he controlled the dosage by the agglutination test. It would seem that if the opsonic index is the true criterion of dose and interval, then the agglutination test is not the true criterion. It is a question whether the Bacilli Emulsion is or is not better than TR in this treatment. The whole subject calls for much careful work with the closest cooperation between the clinic and the laboratory.

The brilliant results recorded by Wright and his colleagues compel enthusiastic attention to the subject, intricate and laborious though its demands are. Only through careful work by many impartial observers can its practical usefulness be shown. If others can achieve the results which Wright and his fellow-workers record we shall be able to treat effectively cases of surgical tuberculosis in which operative treatment and other surgical measures now leave so very much to be desired.

# TUMOR OF THE CAUDA EQUINA REMOVED BY OPERATION RECOVERY

BY R. C. ELSWORTH M.D. M.C. F.R.C.S. ENG

OF SWANSEA ENG

S. Geo. t. th. Sw.      Ge. ral H. p. tal

TUMORS within the spinal canal are of sufficient rarity to justify the publication of the present case. It presented to the surgeon some points of interest and some difficulties in the matter of diagnosis and to the patient the not unimportant one of complete recovery.

Mrs. W. æt 45 a widow. Personal and family history good. Complained of pain (sciatica she called it) in both legs lasting for at least four years. The pain began in the right leg about the middle of the back of the thigh and the painful area could at first be covered with the thumb. The pain was constant and of a gnawing character. She could not bear to sit squarely on a chair owing to the pain and had to sit on the edge so as to prevent the chair from pressing on the back of the thigh. Although the pain was constant it varied in intensity, was always worse after exertion and frequently at night was so severe as to preclude all possibility of sleep. During the last two years the pain has become so severe as to almost completely incapacitate her from carrying on her ordinary household duties. During this time the only position of comparative comfort was lying curled up in bed. When she stood upright the pain rapidly became so severe that she was unable to remain erect but on lying down again the pain would gradually diminish to its usual degree of intensity.

During these years the patient underwent various forms of treatment and consulted many medical men, her case being looked upon and diagnosed differently by each one who saw her. She was treated in a London hospital as a case of sciatica and had the sciatic nerves dry stretched. She also underwent a course of electrical treatment both galvanic and faradic and at a later date in another hospital a course of treatment with the high

frequency currents She was sounded for stone and had the cautery applied to the backs of the thighs At a later date she was treated with rest and splints in a modified Weir-Mitchell treatment

Although the pain began in the right leg, it was when I first saw the patient worse in the left leg

*Physical examination*—The first thing which struck one on looking at the patient was the wasting of the muscles of the buttocks and of the lower limbs The gluteus maximus on both sides was wasted, soft, and flabby, so that the normal contour of the buttocks was lost The hamstrings and ischial portion of the adductor magnus were wasted and flabby The calf-muscles were so reduced in size that all appearance of calf was lost and the anterior tibial muscles were atrophied The quadriceps extensors, though reduced in size, had not lost their contour and the adductors were not obviously affected

The knees could not be straightened and the patient could not stand without support There was no obvious wasting of the quadriceps extensor in either leg nor of the adductors Although there was weakness of the wasted muscles, there was no paralysis The knee-jerks were not altered, there was no clonus, and the plantar reflex was diminished

The measurements of the two limbs showed that they were much smaller than would be expected in a person of that build, and the left was three-quarters of an inch less than the right all the way down There were no tender points to be made out and the tactile and pain sensations were relatively diminished as compared with the front of the thighs, as also was the sensation of heat and cold The skin showed no obvious change and there was no zone of hyperæsthesia either in the trunk or limbs

There was pain on deep percussion over the lower lumbar region and pain was felt in the same place when the patient stood for a few minutes or bent forwards There was no deformity of the spine and no evidence of sacro-iliac disease The bowels were constipated and she did not pass water oftener than once in the twenty-four hours

The salient points of the case were 1 Pain in the back and along the course of the sciatic nerves 2 Wasting of the glutei maximæ muscles and all the muscles supplied by the great sciatic nerves 3 Pain on deep percussion, on bending forward

and on standing in the erect position the pain being felt in the lower lumbar region and radiating along the course of the sciatic nerves. The pain was constant and had been existant for at least four years and the atrophy of muscles had been observed for at least two years.

#### Differential diagnosis

Sciatica was negatived by both sides being affected and by the disease not being limited to the sciatic nerves for the condition of the gluteus maximus clearly showed that the inferior gluteal nerve at least was involved and sciatica could not account for the pain in the back.

Neuritis was negatived by the extent of the lesion its duration the absence of paralysis and the causes which produce that disease.

Pressure on nerves from disease of the sacro iliac joints was negatived by the extent of the lesions its bilateral condition. It was impossible to conceive disease of both joints about the same age producing pressure in almost exactly the same place and to almost exactly the same degree besides there was no evidence of disease of the sacro iliac joints or any other disease in the pelvis.

Finally we are brought down to the spinal canal. Pressure in the spinal canal could produce all the symptoms and that too with a comparatively small lesion. If we look at the condition of the patient for a moment it will be obvious that the lesion from which she suffered was one that involved the fifth lumbar nerve and all the nerves below that level on both sides of the body. That the fifth lumbar nerve was involved was proved by the condition of the gluteus maximus which it will be remembered is supplied by the inferior gluteal nerve derived from the fifth lumbar and first and second sacral nerves and that all the nerves below that point were involved was proved by all the muscles supplied by the great sciatic nerve being wasted and by the retention of urine.

Pain was the first symptom and was constant throughout the disease later wasting and muscular weakness supervened. A lesion in the spinal canal would account for all the symptoms and such a lesion might be due to a Disease of the spine-carries or b Tumor in the canal.

The lesion in this case because of the symptoms and progress must obviously be situated on the posterior aspect of the

canal, so as to produce pain first and weakness and wasting later. And as caries of the spine practically always attacks the bodies and not the laminae, and as there was no evidence of disease of the spine, the spine was excluded. The question of an exostosis on a lamina was put out of account because it seemed impossible that pressure by a hard rigid body could have existed so long and not have produced paralysis. The lesion, it was felt, must be soft because of the absence of paralysis.

Finally the question to decide was, is this a lesion of the cord or of the cauda equina?

A tumor, pressing on the posterior aspect of the spinal cord, must have destroyed the posterior region of the cord before it could have produced weakness and wasting. Moreover the tumor must have been a long one to catch all the roots from the fifth lumbar downwards and this would have meant the abolition of the reflexes and loss of sensation. If, on the other hand, the tumor had not extended over the whole region of these roots, but had been situated over the fifth lumbar segment, then the reflexes below that segment would have been increased by the lower centres being cut off from those above. For these reasons the cord was excluded and finally we come to the cauda equina.

Pressure at the level of the fifth lumbar vertebra would catch the fifth lumbar roots and all the roots below that point. It would catch the posterior roots first and then through them the anterior roots.

Finally we arrive at the diagnosis that the patient is suffering from a tumor in the spinal canal at the level of the fifth lumbar vertebra, that it is soft and probably non-malignant.

Operation January 12, 1907. The spinal canal was opened in the usual manner and the dura mater exposed, and a zone of thickened and congested dura brought to view at the level of the upper border of the fifth lumbar vertebra. On opening the theca an encapsulated tumor was found extending along the body of the fifth lumbar vertebra and into the upper part of the sacral canal for the matter of half an inch. The growth was easily shelled out without injury to the nerve roots. These were all found to be pressed forward against the vertebral body except one, which was pressed against the postero-lateral wall of the subdural space on the left side. After removal of the tumor the edges of the theca were drawn together with a continuous suture.

and the rest of the wound closed in the usual manner deep sutures being used to approximate the muscles and close in the space. The wound healed by first intention and the after treatment presented no special features of interest. A catheter was passed three times daily after the operation for the first ten days so as to avoid any possibility of the dressings becoming soiled and the wound thereby infected. After that time it is interesting to note that the patient voided urine naturally and the usual number of times in the twenty four hours in fact that the retention which she had had so long ceased.

For some weeks the patient complained of pain in the old positions but notwithstanding this she slept well and her limbs began to grow. Seen May 25 1907 she expressed herself as quite well she is able to walk two miles without a rest attends to her ordinary household duties and her garden in which she is much interested. She has gained considerably in weight and the limbs have grown till they present quite normal proportions. The actual measurements of the two limbs before and after the operation are as stated below.

## BEFORE OPERATION

|       | R gh               | Left               |
|-------|--------------------|--------------------|
| Thigh | 16 $\frac{7}{8}$ " | 16 $\frac{3}{4}$ " |
| C lf  | 12 $\frac{3}{4}$ " | 11 $\frac{3}{8}$ " |

## AFTER OPERATION M y 25th 1907

|       | R gh               | Left               |
|-------|--------------------|--------------------|
| Thigh | 21 $\frac{1}{4}$ " | 21 $\frac{1}{4}$ " |
| C lf  | 14 $\frac{3}{8}$ " | 13 $\frac{1}{4}$ " |

The pathological report stated that the tumor was fibromuscular with large vessels but no trace of malignancy.

# MULTIPLE EXOSTOSES, INCLUDING AN EXOSTOSIS WITHIN THE SPINAL CANAL WITH SURGICAL AND NEUROLOGICAL OBSERVATIONS

BY EDWARD H OCHSNER, M D,

OF CHICAGO,

Attending Surgeon to the Augustana Hospital, Adjunct Professor of Clinical Surgery in the University of Illinois,

AND

THOR ROTHSTEIN, M D,

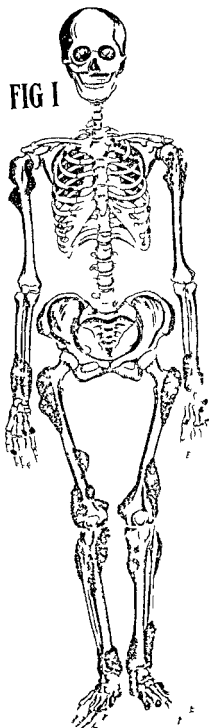
Assistant Professor of Medicine, in Rush Medical College

EXOSTOSES of the human skeleton occur as chondroma, osteochondroma, and osteoma. They are not very common and fortunately those cases in which the exostoses cause marked disturbances are very rare. In the following case one of the exostoses caused serious trouble.

The patient, male, age twenty-three, was admitted to the Augustana Hospital October 8, 1906. No history of similar trouble among any of his relatives for several generations back. Father died at the age of forty with meningitis, probably tubercular, after an illness of several weeks. His father's left hand had been injured in a saw-mill several years before his death, causing ankylosis of all of the fingers of the left hand, the index and middle finger being held straight, the ring and little finger slightly flexed. There were also numerous bony irregularities on these fingers. During his last illness, while the mother was several months pregnant with the patient, the mother repeatedly stroked this irregular hand. Patient and patient's mother ascribe his exostoses to this prenatal influence, more especially as the patient habitually held his left hand in this same position during the first few years of his life, though the joints were never ankylosed. Except for these multiple exostoses patient has always been well.

At the age of fourteen first occasionally noticed slight incoordination of the lower extremities. When trying to move quickly and especially if tired, lower extremities would tremble.

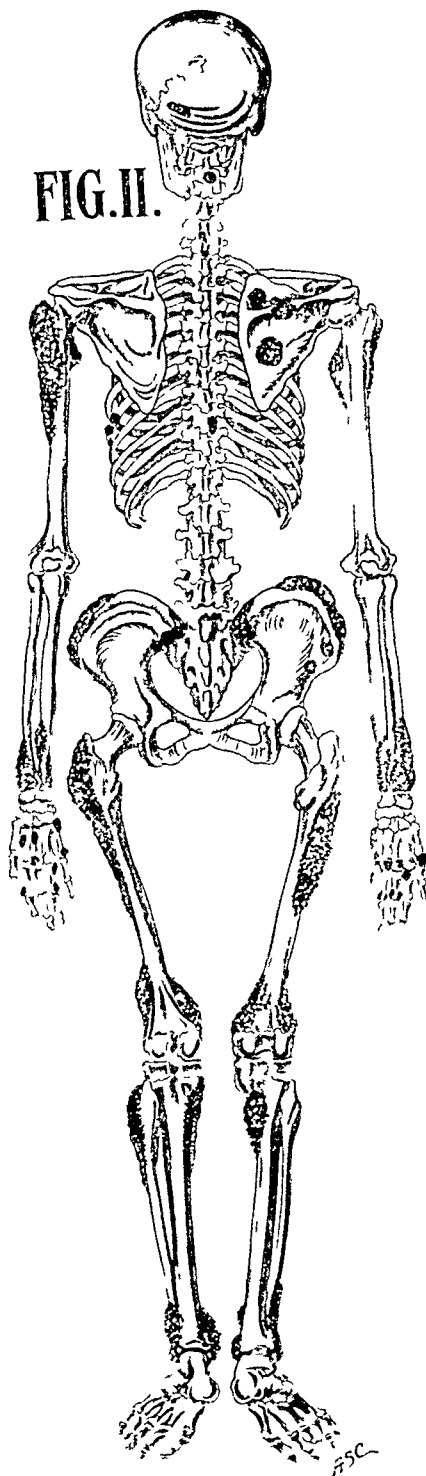
FIG 1



At i f k l w h m p l o s t o s e n .



**FIG. II.**



Posterior view of skeleton with multiple exostoses

and he could not place the feet exactly where he wished them to go This became appreciably worse especially in the right leg and later appeared in the right arm Since February 1906 his right leg has dragged more than usual his right hip seemed more stiff and he had greater difficulty in walking Since August 1906 he has noticed that he has had less accurate control of his right arm and hand and that the tactile sense of his left arm and hand was somewhat impaired From this time on the condition grew progressively worse though there were intervals of slight remission lasting sometimes for only a few hours at a time so that by November 27 1906 the patient was unable to walk at all even with crutches

March 1906 while pitching hay and straining considerably he had a feeling as of wrenching his neck which caused pain on the right side of the body lasting about two hours One month later he suddenly turned his head to the right and had a similar pain plus a pricking sensation in the back and right side of body After this every time he turned his head suddenly to the right this same pain would recur Turning to the left caused no trouble Since May 1906 he never turned his head to the right instead when wishing to turn to the right he would rotate the whole body June 1906 patient injured right knee causing as he thinks a laceration of the ligaments

On careful examination we found one-hundred and eight exostoses as represented in Figs 1 and 2 It is to be observed that there is one on the left superior curved line of the occipital bone This is very unusual In a rather careful study of the literature we were unable to find any reported case of an exostosis springing from the external surface of the bones of the roof of the cranium It is supposed that the bones of the roof of the cranium are developed in membrane hence are epiblastic in origin while nearly all the remaining skeletal bones are developed from cartilage and are mesoblastic in origin It has occurred to me that possibly there is this developmental reason for the fact that exostoses do not as a rule spring from the roof of the cranium while they are found attached to practically any one of the other bones and it may be that in this case the tabular portion of the occipital bone

developed from cartilage instead of developing in membrane and that this might account for the exostosis which we find here springing from the superior curved line of the occipital bone

A very common location for exostoses is the ventral surface of the scapulæ, and in this case too we find a large exostosis on the vential surface of the right scapula. The epiphyseal lines of the long bones and the insertion of tendons are also favorite seats for their development and in these two points our case conforms to the general rule. Their location and attachment to the various bones, as well as the density of the tumors is very clearly brought out by the skiagrams kindly furnished me by Dr. Reichmann, as represented by Figs 3 & 4.

The question as to the age of development of these exostoses is still unsettled. In this patient the exostoses were first noticed at the age of two, and the patient thinks they continued to grow at about the same rate as the body and stopped growing with the body at the age of nineteen. This also is very doubtful, however, because it was not until after he was nineteen that the cord symptoms became at all pronounced, and my assistant, Dr. Abelman, who has observed this patient very carefully for the last four months is of the opinion that several of the exostoses, especially the one under the right scapula, have increased in size since the first examination. By some writers it is also claimed that these exostoses will occasionally spontaneously disappear in later life. In this case we have no evidence that any have either decreased or have disappeared.

With the above history the question naturally arose as to how much of the disability was due to the rather severe injury to the right knee which the patient had sustained in June, 1906, whether or not there was some central nerve lesion, and if a central nerve lesion, was it an undiscovered exostosis making pressure upon the central nervous system, or was it a disease of the central nervous system itself. For solution of this question the patient was referred to the neurologist, Dr. Rothstein, whose findings of the nervous symptoms follow below, and who was



FIG 4



Skirgram showing femora

able to make a rather definite diagnosis as to the location of the trouble. He referred the disturbance to the right half of the cord between the base of the skull and the upper border of the fifth cervical vertebra probably opposite the second

The patient was consequently anesthetized and the incision made in the median line extending from the external occipital protuberance to the sixth cervical vertebra muscles and fascia separated from the vertebra spinous processes and laminae of the second and third cervical vertebrae removed with bone forcep and attached by a small pedicle to the anterior surface of the right half of the second cervical vertebra. The tumor represented by Fig 5 was found within the dura pressing upon the cord and flattening it out considerably. The tumor proper was attached by the small pedicle to the lamina of the vertebra the pedicle passing through a small hole of the dura the tumor itself lying within the dura directly on the cord. When the tumor had been removed the cord appeared normal and bulged out. Fig 5 represents the condition found as accurately as could be determined. The left lamina seemed to be more vertical than normal and shorter while the right was longer than normal the spinous process was consequently deflected a little to the left of the median line. Fig 6 shows an average second cervical vertebra of normal size while Fig 5 represents a drawing based upon the normal in size but modified in shape according to the conditions observed with the tumor drawn in its actual size.

It seems almost incredible that the cord could have sustained so much pressure for so long a time and not have suffered more. The dura had to be incised in order to get the tumor out and no attempt was made to suture it. A small gutta percha drain was introduced down to the cord the wound closed and a large antiseptic dressing applied.

All of the operating on the vertebrae was done with the greatest care and the tumor removed as gently as possible and yet on regaining consciousness the patient complained of numbness of the whole body and was unable to move any of his extremities anal sphincters were completely relaxed the bladder was paralyzed. Five hours after leaving operating table slight motion in left arm and leg but none in right sphincters still relaxed bladder still paralyzed. Eighteen hours after leaving operating table complete loss of sensation of left upper extremity

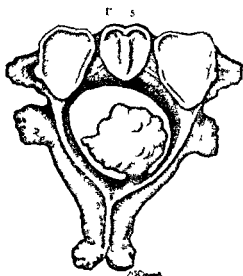
impairment of sensation in remaining extremities, motion of left arm and leg fair, except that left arm was ataxic, muscle sense being completely lost, right arm and leg, right half of diaphragm and right intercostal muscles completely paralyzed. About two weeks after operation, motion began to return on the right half of the body, and since this time sensation and motion have slowly but gradually improved, and now three months after the operation he is greatly improved. He is now able to move his neck in every direction without the slightest pain and he is able to walk very comfortably with crutches, though he still suffers considerably from ataxia. His exact status is also given below by Dr Rothstein.

It is only occasionally that operative intervention is required in cases suffering from multiple exostoses, because fortunately these tumors are usually located where they do not cause any great harm or inconvenience. Some of the indications for operation are excessive weight of the tumors, or their location in places where they cause pressure sores, interference in the mobility of joints, pressure upon nerve trunks with their resultant neuralgias and pressure upon important organs as in the case above given in detail.

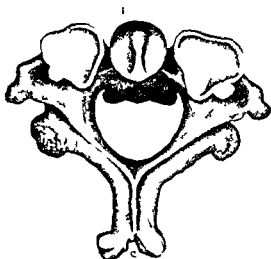
Some years ago I saw a case in which it was necessary to remove an exostosis from the upper end of the radius because it caused interference with the rotary motion of the forearm. Recently I have had to remove a multiple exostosis of the lower end of the radius for the same reason. These three cases are the only cases of exostosis that I have ever seen where operative interference seemed indicated.

#### NEUROLOGICAL OBSERVATIONS

When I first saw the patient he presented the picture of a spastic paresis, more marked on the right than on the left side. He was able to walk but little on account of the stiffness in his legs. After a few steps his legs, especially the right one, would come into a state of trembling, making it impossible for him to walk. The trembling once started would persist for some time, but would gradually subside during rest. Active movements



E ostoses p i g g f m f h i f d g w g b p l a l



N m l i o r p w i h l e a s e l h f i g 5.





would cause trembling also in the arms intense in the right arm slight in the left His right arm was contracted being held in adduction and flexed to right angle in the elbow joint and the hand was halfway closed He was able to execute actively only very slight movements in the shoulder joint and in the elbow joint flexion and extension of about ten degrees The fingers could only be slightly extended and flexed the hand being completely useless With the right leg he could execute active movements more freely but all the movements were weak and much limited in comparison to the normal

Passive movements in any joint of upper or lower right extremity would meet with intense resistance The left arm and left leg were weak but could be freely moved actively Passive movements would meet with some resistance

The tendon reflexes of all four extremities were increased Wrist and patellar clonus existing on right side foot clonus on both sides a strong Babinsky reflex on right and a slight but distinct Babinsky reflex on the left side

The cutaneous reflexes were lively

The only disturbances of the sensibility possible to demonstrate were a slight ataxia in left arm and leg and inability to recognize objects with his left hand when his eyes were closed

His tongue was slightly asymmetrical the left half being somewhat smaller than the right and when the tongue was protruded it would sometimes deviate to the left

The fundi of the eyes were normal but a distinct nystagmus could be observed when the eyes were moved to the extreme left or right

He had perfect control of the sphincters

The above described symptoms might suggest the diagnosis of a disseminated sclerosis or some other kind of sclerotic process in the central nervous system

The patient presented however a symptom which directly pointed to the existence of an exostosis in the spinal canal As Dr Ochsner already has mentioned the patient sometimes felt a sharp pain shooting through his whole body when he turned his head to the right This pain occurred only when he turned his head suddenly to the extreme right Sometimes it happened that at the same time as the pain was felt in his whole right side from the neck down to the toe he also felt a pain shooting upward in

the back of his head on the right side. When he, immediately after such an intentionally produced pain, outlined the course of the pain in the back of the head, it was found that the pain followed the course of *nervus occipitalis minor* on the right side. As *nervus occipitalis minor* gets its fibres from the second and third cervical root (that is, the nerves which leave the spinal canal, the one immediately above and the other immediately below the second cervical vertebra), the mentioned symptom pointed towards the second cervical vertebra as being the seat of the tumor. By examination of the shoulder muscles it was found that the *musculi rhomboidei* and *musculi levator anguli scapulæ* on the right side were much weaker than the corresponding muscles on the left side, and percussion of the *trigonum scapulæ* would cause much more lively contractions in *rhomboidei* and *levator anguli scapulæ* on the right side than on the left. As the new fibres which supply *musculi levator scapulæ* do not leave the spinal cord lower down than the fifth segments (corresponding to the level of fourth cervical vertebra), it was clear that if the spastic process was due to anosteomia this must sit on the fourth cervical vertebra or higher up.

On account of the mentioned pain along the *nervus occipitalis minor* it was, however, considered that the supposed tumor most likely would be found on the second cervical vertebra. The motor symptoms being so much more pronounced on the right side, it was necessary to assume that the tumor pressed upon the right side of the cord, but there one would expect some of the symptoms usually present in a half-sided lesion of the cord. A slight suggestion of such a lesion gave the ataxia of the left extremities and the sensory disturbances of the left hand. The nystagmus and asymmetry of the tongue might be explained either as congenital or as symptoms of intrinsic affection of central nervous system.

A week after the operation the patient presented a typical picture of half-sided lesion of the cord, with loss of all the different qualities of sensation, including muscle-sense, on the left side, with hyperæsthesia and flaccid motor paralysis on the right side. He gradually improved, and three months after the operation his condition was the following. Active motility of left upper and lower extremity normal, no stiffness on passive movements. Right arm can be adducted from the body and lifted up to  $135^{\circ}$ .

and rotation is nearly normal Full flexion and extension are possible in the elbow joint but by extreme extension motion becomes a little slow

Pronation and supination are of less than normal degree Flexion and extension of right wrist joint 40 The thumb can only be slightly extended and flexed The right index finger can be fully extended and flexed but the other three fingers cannot be extended fully especially not the little finger He can spread and adduct the fingers to some degree The grip of the right hand is weak but has increased considerably in strength By passive movements some resistance is felt but the stiffness is easily overcome

The passive and active movements in the ankle and toes are nearly normal some resistance existing in the ankle joint by passive movements The movements of left knee and hip joint could not be examined on account of a plaster cast having been put on the leg

The patella reflex on left side somewhat decreased On left side no ankle clonus is present and only a slight amount on right side A slight Babinsky reflex can be elicited on left and also on right side

The tendon reflexes of right arm seem about normal The abdominal reflexes are more lively on left than on right side

Sensation for touch temperature pain and muscle sense were normal on right side On the left side a slight stroke with cotton would not be felt over dorsal aspect of the two extreme phalanges of all the fingers neither would it be felt over dorsal aspect of foot and toe If the pressure of the cotton was made a little heavier the touch would however be felt The patient stated himself that although he felt the slight touches of cotton over the rest of the left side he did not feel the touch nearly as clearly on the left as on the right side

Sensation for pain was decidedly decreased over the whole left side with exception of the area supplied by nervous trigeminus

All passive movements in any joint on left side he would perceive and judge nearly correctly but by active movements a marked ataxia was apparent in the hand An object knife coin etc put in his left hand (when his eyes were closed) would not be identified and invariably dropped

Sensation for temperature was decidedly diminished on the left side

The nystagmus seems to be less marked than before the operation

The patient returned to the hospital and was examined again May 30, 1907

He is considerably improved. He is able to use his right hand to some extent, to dress himself and button his clothes, which was impossible for him in the month of March. He walks now without crutches, but his right arm is carried somewhat stiffly, usually flexed in the elbow joint. The right leg is still in a cast. The right arm can now be stretched straight upward, and can be fully extended and flexed in the elbow joint, although the last part of the extension is still a little slow.

Flexion and extension in wrist joint to  $45^{\circ}$  and  $50^{\circ}$ . Fingers can be fully extended and flexed except thumb and little finger. Grip of right hand has gained considerable in strength, but is still much weaker than grip of the left hand.

Passive movements in all joints of right extremities meet with some resistance, especially if the movements are done suddenly.

Marked Babinsky reflex. Foot and patellar clonus exist on right side.

The tendon reflexes of right arm increased.

On the left side stroking of the foot sole causes flexion of the big toe and the patellar reflex is lively. Abdominal and cremaster reflex much livelier on left than right side. Feels slight stroke of cotton over whole left side, but sensation a little uncertain over dorsal aspect of the foot and toes. Sensation for pain has improved, but needle is still felt less sharp on left than on right side. His ataxia is also considerably less than in the month of March. Objects put in his left hand are usually not recognized, but they are felt and not dropped.

The reflexes which after the operation became decreased have later gradually increased, such as the left patellar reflex, the foot clonus on the right and the tendon reflexes of the right arm. But the Babinsky reflex on left foot disappeared, and the sensibility and mobility have in the same time improved.

The nystagmus is markedly less than before the operation.

# TUBERCULOSIS OF THE ELBOW ARTHROPLASTY

BY GUALTIERO DE AMEZAGA M D

OF BOSTON MASS

THE following is a brief account of a successful attempt to reestablish a hinge joint at the elbow after resection of the joint for tuberculosis. The result is the more interesting since the case has been followed for three years after operation.

*History* R P 18 yrs—She was first seen at the Massachusetts General Hospital in 1903 where she was successfully operated upon for tubercular glands of the neck. There has been no recurrence after four years.

In the following year March 18 1904 she again appeared at the Massachusetts General Hospital with a history of pain in the right elbow. The following notes were made at that time.

About one month ago R P began to have pain in the right elbow when she used that arm and this pain has continued ever since. An attempt to straighten the elbow is unsuccessful and causes great pain. Heat and swelling have been present during the period when the pain has been noted. The pain is worse at night and is relieved somewhat by elevating the elbow on the pillow. X ray examination and internal angular splint advised.

The day after the first examination the patient returned and was re examined with the X ray plate for comparison. The elbow gave signs of fluctuation and the X ray plate showed foci in the ulna with a certain amount of disintegration of the joint. Operation was advised but refused.

The girl went about to the various out patient clinics of the city where she was advised to have an operation. She came to me in June 1904. I advised and performed immediately resection of the elbow joint.

*Examination*—At the time of the operation the elbow was large swollen and tender. On either side of the olecranon process and the biceps tendon a bulging mass presented which gave signs of fluctuation. A short time before I first saw it the joint had been punctured on its inner aspect from which a

mixed infection had resulted, marked by a temperature elevation to  $104^{\circ}$ , increased tenderness, and constitutional symptoms. The motions of the joint, at this time, were limited. The forearm was habitually extended to about  $120^{\circ}$ , though it could be flexed to  $80^{\circ}$ , an angular excursion of some  $40^{\circ}$ . This motion was obtained with great difficulty, and at the expense of eliciting severe pain in and around the joint. As to pronation and supination, the wrist could be twisted from a position of  $90^{\circ}$  pronation to  $45^{\circ}$  supination, in other words, rotatory motion at the elbow joint was much limited. The bulging synovial cavity, with the surrounding infiltrated structures, constituted a tumor about four inches in diameter, antero-posteriorly, and about four and one-half inches measured in a lateral plane. The physical signs, therefore, showed advanced disease of the elbow joint with distension of the joint capsule, spasm of the adjacent muscles, and infiltration of the soft parts in relation.

A series of operations was done in this case. The patient was etherized on eight occasions, on all but three of which the procedure was in the nature of an ether dressing to break up adhesions, or to curette a cavity.

*First Operation, June, 1904—Incisions.* These were three and, together formed an H-shaped figure placed in the following manner:

(1) A five-inch incision was made over the olecranon, parallel with the long axis of the bone. This passed through the triceps tendon and muscle down to the capsule.

(2) A second four-inch incision was made parallel with the first over the internal condyle.

(3) A cross-cut connected the two previously made incisions. This was made with the greatest care to avoid wounding the ulnar nerve.

The joint was opened and found to be disintegrated and filled with grumous, infected material. The flaps were reflected, and the disease followed upwards and downwards into the arm and the forearm. The forearm muscles were separated from their attachments to the condyles of the humerus, and subperiosteal resection done four inches above the condyles. The periosteum was left intact nearly to the joint.

The upper halves of the ulna and the radius were riddled with disease, and by curettage and excision the mischief was

cleaned out. The removal of the foci and their extensions required the resection of the head of the *radius* close to the bicipital attachment. Behind this a shell of periosteum remained as the interior of the bone was scraped away for nearly its upper half. In the *ulna* complete section was done just behind the coronoid process. From this point a narrow spicule of bone reached back for two inches until it lost itself in the periosteal cavity which was the relic of the upper half of the *ulna* after scraping away the disease. The bony bit left behind at the upper extremity of the *ulna* overlapped by two and one half inches the point reached by the periosteal remnant of the *radius*. As will be seen later the subsequent development of this bony ulnar extremity proved of marked mechanical value in the construction of a tightly fitting joint. The interosseous nerve was identified during the dissection and preserved. The longitudinal cuts were approximated with interrupted sutures since the tissues were too infected to allow suture by layers. The cross cut was left open and the gap thus provided was utilized for drainage purposes. The joint drained for eight weeks and various materials were employed to keep it open while the periosteal cavities were filling. silk worm gut strands arranged in fagots proved very satisfactory.

The extremity was put up in extension and held there for two weeks. During this time the periosteal sacs had become slightly stiffened and a move was made to effect more complete isolation of the bones above and below the operative site.

*Second Operation Two Weeks After First*—The patient was etherized and gauze packing insinuated between the upper and the lower arms thus filling the granulating cavity left at the field of the previous operation. The extremity was again placed in extension and thus retained for the two weeks following.

*Third Operation Four Weeks After First*—There seemed to be a distinct rigidity discernable in the region of the periosteal shells. The sponge packing was removed and the bones of the lower arm lifted until their cut ends bore upon the shell of growing bone which was now replacing the old and forming the new lower articular surface of the humerus. The overlapping fragment of the *ulna* was passed by the humerus to the inner side thus permitting the approach of the *radius* to and its articulation with the humerus.

The extremity was fixed in a position of acute flexion. In



this posture the bones were immobilized for two months by means of internal splints angular to various degrees of acuteness. Passive angular and rotary motions were undertaken two days after the third operation, the arm being restored to the splint after the exercise.

Ether was given subsequently five times, as alluded to earlier, sometimes with the intention of freeing adhesions, at others of loosening tags of detritus caught in the sinus.

*End Results*—There is a *shortening* of four inches in the affected arm. An effort was made at the first operation to save part of the epiphyseal line on the ulna, but it is doubtful whether it was successful. If my measurements do not deceive me, during the past year the difference in length of the two arms has been reduced nearly one inch.

*Motions Rotatory* is perfect. In pronation the projecting ulnar process hugs tightly the humerus, thus gaining a *point d'appui*, so that the spiral rotation of the radius over the ulna causes no lateral displacement or wobbling. Perfect supination is present.

*Angular Motions*—Flexion—to 36 degrees, extension—to 150 5 degrees.

*Motions of the Fingers*—These are perfect, strong extension and flexion, being both accomplished with freedom.

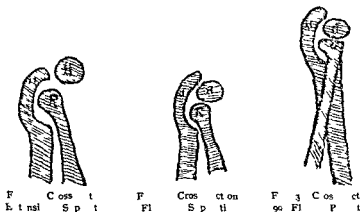
### *The Mechanism of the Joint*

*Angular Motion*—As a whole, *during extension*, the ends of the forearm bones rest near the upper edge of the notch in the humerus. The ulna, at this time, is separated from the humerus for about one-quarter inch, the end of the radius remains attached to the ulna, but in front of the humerus. As the arm is flexed the radius and the ulna are pushed backwards and downwards, backwards until close articulation with the humerus occurs, whence it glides downwards for about a half inch along the curve of the socket, where it rests during the completion of flexion.

*Rotary Motion*—In supination the radius lies in front of the humerus, slightly to the inner side, in close relation with the ulnar end. At this point the ulna forms a hook and articulates with the other two bones as follows: the lower half

of the hook supports the radius and provides a fulcrum for the same quite similar in principle to the relationship of these bones in a normal joint. The upper half of the hook bears upon the humerus. *When pronation occurs* the new radial head turns in its new bed while the shaft twists over and to the inner side of the ulna. This twist pushes the ulnar hook outwards until it meets the humerus when ulna and humerus lock firmly together and here they remain in close embrace while complete pronation is effected.

*Conclusion*—No general conclusions can be drawn from one case. It would seem however that a good mechanical



outcome should generally follow the employment of the technique described above since this successful result was obtained in the face of unusual difficulties. The widespread tubercular involvement of the bones and the soft parts, the mixed infection and the indolence of the reparative process presented a discouraging picture. In cases of ankylosis in which the original infection had subsided these primary obstacles to success would be minimized.

Many attempts have previously been made to obtain a fulcrum for the play of the arm bones. The introduction of soft parts between the bony articulating surfaces may prevent ankylosis but it cramps the motions by omitting to provide for a socket.

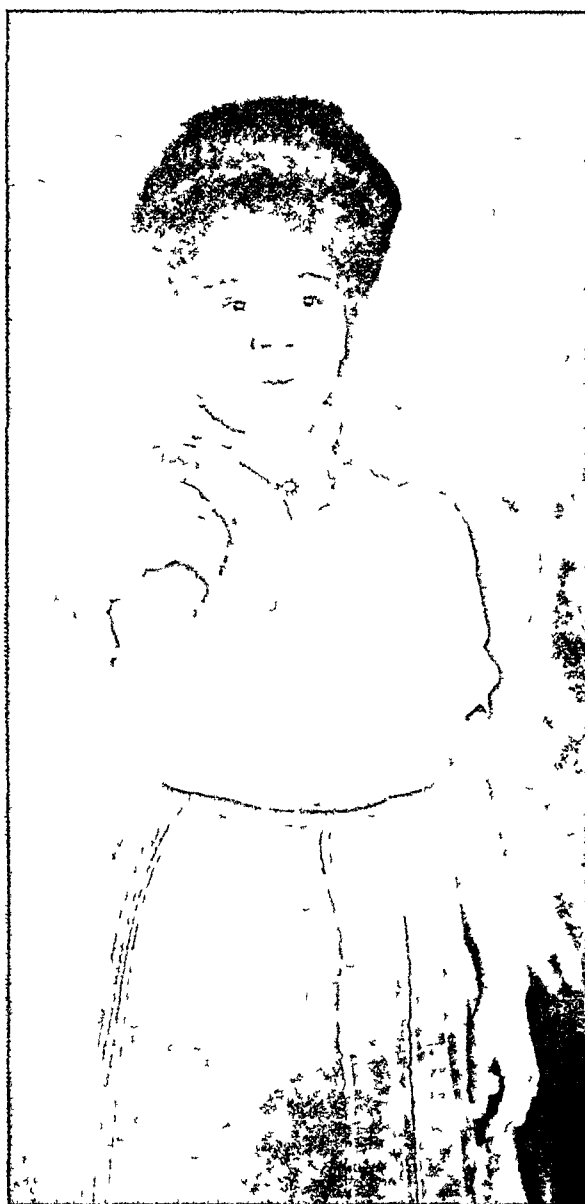
The obvious disadvantages of a flail joint need no comment. The two factors which contributed chiefly to the restored elbow function of my case were (1) the new socket in the humerus, (2) the firm grasp of the humerus by the hook of the ulna.

It is now three years after operation, and the girl is working in a factory eight hours a day, and often carries heavy weights up and down stairs with the operated arm. The gross and the X-ray photographs are explained by their legends.



F i e s t f r t l p l t y f h t l b o    L a t r a l i w t d d t 5 5 9 0 " 3 y e a r s  
f    p e t

FIG V

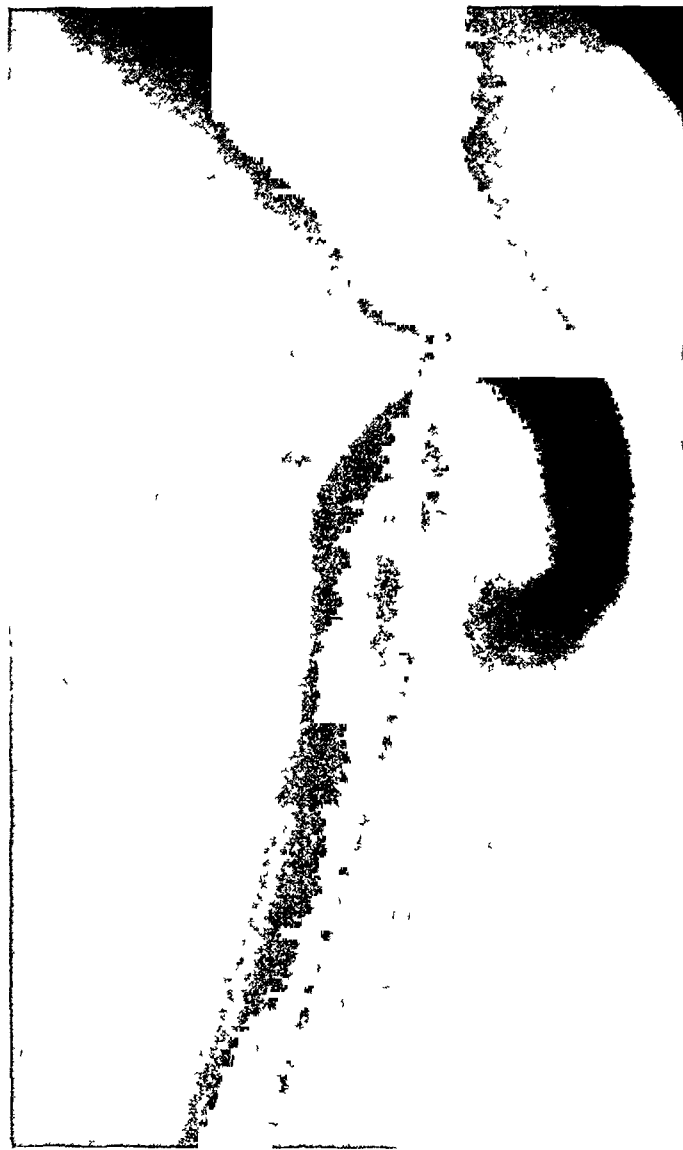


Final result of arthroplasty, right elbow Lateral view, flexed to  $36^{\circ}$ , 1907 Complete flexion



Art. pl. y righ. lbo. La. ral. ew. fl. ed. t. 4. co. po. d. t. Fig. V. N.  
 l. t. l. f. earm. bo. ca. t. p. f. h. m.

FIG VII



Arthropathy, right elbow. Lateral view extended to 150 S°, 1907, corresponds with Fig IV. Note separation of Lones during extension, scattered bony deposits about joint, tip of ulnar process slightly overlaps humerus



Arth pl y ri l lb A o+ l po t i  
 ded so s i l f bel d py rrespo d th  
 Fg IV Th w ctly f b k  
 som wh t from h l will Th l w h h l f  
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## OLD UNREDUCED POSTERIOR DISLOCATIONS OF THE SHOULDER.

BY JOHN G SHELTON M D

OF KANSAS CITY MO

THE importance of the long tendon of the biceps in preventing and maintaining reduction in certain cases of dislocation of the shoulder has generally escaped attention. It seems probable that in posterior dislocations of the shoulder the long tendon of the biceps may be torn from its groove between the tuberosities of the humerus and on account of its displaced position not only interfere with the reduction of the dislocation but may displace the head of the humerus after reduction has been accomplished.

CASE—A posterior dislocation of the head of the humerus was reduced three times during the first month after the accident occurred. Reduction was accomplished at each attempt but the dislocation promptly recurred. Examination eight months after the injury showed the biceps tendon displaced from its groove and passing directly from its origin over the centre of the glenoid fossa. No bloodless reduction was attempted at this time. The joint was exposed, reduction accomplished, the displaced tendon of the biceps put into place and retained between the tuberosities by means of a periosteal bridge and the soft parts repaired as much as possible. At this time one year after the operation was performed the extremity is useful and painless.

Alexander W. a clerk thirty eight years of age was thrown from a bicycle during July 1905 producing a posterior dislocation of the right shoulder. Reduction was accomplished without the use of general anæsthesia. Examination one week later showed that the dislocation had recurred. A surgeon was called in who reduced the dislocation under general anæsthesia. Recurrence was prompt and in two or three days reduction was again accomplished under general anæsthesia. It was said that the last reduction was difficult and prolonged. In a week the bones were

again found out of position, but no attempt was made to put them in place

The extremity was painful and practically useless. During the next few months the pain increased in severity and the muscles became atrophic, although massage and passive motion were employed.

I saw the patient with Dr A N White, of Denver, Colo., about eight months after the injury occurred. At this time the dislocation was easily made out, and it could be determined that the long tendon of the biceps no longer occupied its normal position in the groove between the tuberosities of the humerus, but passed from its origin directly over the glenoid fossa of the scapula. There was no sensory or motor paralysis.

*Operation* was performed March 12, 1906. The joint was exposed by a deltoid flap, dividing the deltoid near its insertion and turning the muscle upward. The head of the humerus was found in the subspinous fossa. The supraspinatus, infraspinatus and a portion of the teres minor were detached from the greater tuberosity. The long tendon had been torn from the bicipital groove and the transverse ligament had been destroyed. The capsule of the joint had been detached from the head of the humerus and was contracted into a cicatricial mass about the glenoid cavity. It was incised and pushed out of the way sufficiently to clear the glenoid fossa. Reduction was then attempted but could not be accomplished. It was found that the subscapularis, which had not been torn from its insertion, prevented reduction. This muscle was divided in sections close to the lesser tuberosity. The dislocation was now reduced. The biceps tendon was placed between the tuberosities and a flap of periosteum sutured over the tendon to hold it in place, making, as it were, a new transverse ligament. It was impossible to repair the joint capsule. Some of the cicatricial tissue, together with a portion of the fascia of the under surface of the deltoid, was sutured to the periosteum over the tuberosities to assist in maintaining reduction. The deltoid was united with catgut and the wound closed without drainage. The arm was held in abduction with a plaster dressing.

Ten days later the dressing was removed and the wound found to be healed throughout. The arm was gradually brought down to the side. Passive movements and massage were resorted

to and voluntary motion was encouraged during the third week following the operation. Two months later the patient had very good control of the extremity. Flexion and internal rotation were normal but outward rotation was somewhat limited and abduction very slight. The strength and range of motion gradually increased so that six months after the operation was performed the extremity was sufficiently serviceable to accomplish ordinary work. One year after the operation the patient states that the arm is as good as the other one. This statement must be modified. I recently examined the patient and found a very useful extremity indeed but found abduction limited to the horizontal position. Further abduction is accomplished by an upward rotation of the scapula and not by movement at the shoulder joint. The deltoid is weak but does not seem atrophic. The remainder of the extremity is apparently normal. The shoulder and arm have not been painful at any time since the first week after the operation.

The reports of cases of old unreduced posterior dislocations of the shoulder are so few that it is impossible to draw definite conclusions regarding the indications for operative treatment or the operative procedure that is best suited to these patients. It is generally agreed that operation should be done when bloodless methods fail to reduce the dislocation and if operation is necessary early operation is desirable. Not all surgeons deem it advisable to perform early operations in these cases. According to J. E. Mears<sup>1</sup> many operators especially English surgeons advise operating six to eight weeks after the dislocation has occurred. Souchon who in 1897 made an exhaustive study of old unreduced dislocations of the shoulder states that "It goes without saying that no operation should be attempted before all possible means of bloodless reduction have been conscientiously applied in recent as well as in old irreducible or unreduced dislocations." There may be exceptions to Souchon's statement, and it would seem from the case herewith reported and a consideration of the anatomy about the shoulder joint that a displacement of the long tendon of the biceps which may occur in backward

dislocations of the shoulder, is a condition that demands a violation of this very good rule. If in a posterior dislocation of the shoulder it can be determined that the long tendon of the biceps has been torn from the bicipital groove operation should be done at once. Even if reduction can be accomplished by manipulation the abnormal position of the tendon, passing over the shallow glenoid fossa, will, when the biceps is contracted, force the head of the humerus out of its normal position.

The literature on this subject throws no light on the importance of the biceps tendon in these cases. Briddon, Reid,<sup>3</sup> Adams,<sup>4</sup> and J. H. Brinton,<sup>5</sup> who have reported operated cases of old unreduced posterior dislocations of the shoulder, do not mention the biceps tendon and do not speak of rupture of the transverse humeral ligament.

#### TYPE OF OPERATION

Resection of the head of the humerus has been the operation performed in three out of the four cases of unreduced posterior dislocations of the shoulder operated upon. Briddon and Adams report "good" results following resection in their cases, while Reid states that three months after the operation abduction was limited, but the patient had been benefited by the operation. J. H. Brinton produced a fracture of the humerus, with a resulting false joint, in his case and reports a "good result." All of these reports are indefinite regarding the pathology of the dislocations, the description of the operations, and the results obtained.

A study of the reports of unreduced dislocations of the shoulder—other than the posterior variety—suggests that operation is indicated in posterior dislocations when bloodless methods fail to accomplish reduction, and in all cases in which it can be determined that the biceps tendon has been torn from its groove, and that reduction is preferable to excision or other operative procedures. The subcutaneous division of adhesions, recommended by the French, should be supplanted

by free exposure of the parts. Of the many methods advised in operating on these cases the one turning up the deltoid in the flap gives the best exposure of the shoulder joint and the surrounding structures. The straight or slightly curved incisions are preferred by some operators. The long anterior incision seems to be the one of choice in treating old unreduced anterior dislocations of the shoulder.

I was surprised that I could find the reports of only four cases of old unreduced posterior dislocations of the shoulder treated by operation.

CASE I—Bridgman reports a subspinosus dislocation of the head of the humerus in which manipulation failed to accomplish reduction. The head of the bone was resected. The result is described as being good but no details are given.

CASE II—Reid treated an old unreduced posterior dislocation of the shoulder by resecting the head of the humerus. Three months later the arm was freely movable with the exception of abduction which was limited.

CASE III—Adams resected the humeral head in a posterior dislocation of the shoulder that could not be reduced by bloodless manipulation. The patient, who was a porter, was able to perform his duties without difficulty a few months after the operation was performed.

CASE IV—Brinton being unable to reduce an old posterior dislocation of the shoulder exposed the joint by using a V-shaped incision. Reduction was not accomplished but a fracture was produced below the head of the humerus making a false joint. He reports a good result.

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# PARTIAL LOSS OF THE TIBIA REPLACED BY TRANSFER OF THE FIBULA, WITH MAIN- TENANCE OF BOTH MALLEOLI OF THE ANKLE ✓

BY JAMES S STONE, M D,

OF BOSTON,

Surgeon to the House of the Good Samaritan, Assistant Surgeon to the Infant's Hospital,  
Junior Assistant Surgeon to the Children's Hospital, Assistant in Surgery in the  
Harvard Medical School

W B, a boy five years old, had in June, 1904, an acute dissecting periostitis beginning at the lower end of the right tibia and in six days stripping the bone nearly as far as the patellar tubercle. Owing to sloughing of the periosteum after the removal of the shaft the tibia regenerated very imperfectly. Nine months after the onset of the trouble the bone had reformed for about an inch and a quarter from the upper end. There was then a gap of about an inch, below which was a thin strip of bone two inches long, reaching down to within about half an inch of the lower epiphysis from which a little new bone had grown upward. The fibula was normal. The appearance is shown well in the radiograph taken at that time (Fig 1)

In August, 1905, thirteen months after the onset of the trouble, the boy was admitted to the General Surgical Service of the Children's Hospital for operation. Since ten weeks after the trouble began he had been going about with a plaster bandage and Thomas knee splint.

The attachment of the upper end of the fibula had become loose so that the head of the bone could be shoved upward slightly and the foot could be moved inward for about two and a half inches. There was marked shortening of the leg, varying with the position in which the foot was held. The foot was a little smaller than on the sound side. The fibula had become somewhat hypertrophied, particularly at the middle of the shaft. All wounds were solidly healed (Fig 2)

It was decided to transfer the fibula into the gap in the tibia

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\* From the General Surgical Service of "The Children's Hospital," Boston, Mass. (Service of Drs H L Burrell, H W Cushing, and J S Stone)

The upper end was transferred first. A vertical incision about three inches long was made directly over the lower end of the upper sound portion of the tibia. The cut was made directly through the periosteum which was separated on the fibular side for a vertical distance of about two inches. The muscles were then separated along the interosseous membrane until the fibula at the same level was exposed. In order to reach the fibula more readily a second incision about an inch and a half long was made directly down onto the bone on the outside of the leg. At a point about two inches from the upper end the fibula was then cut across with a chain saw. The upper end of the lower fragment was then inserted into a mortise cut in the tibia. This mortise was cut at a level slightly lower than that at which the fibula was cut across in order to gain length if possible. The periosteum was reflected from that side of the fibula which rested in the mortise. The reflected periosteum of tibia and fibula were then sutured together with chromic catgut to maintain close apposition and the reflected periosteum of the tibia was further sutured as a cuff around the upper end of the fibula to hold it more securely in position. The muscles were then allowed to slip back into their former positions as far as possible. A few dead spaces were closed by catgut sutures uniting the fasciæ. The incisions were closed without drainage. A sterile dressing and plaster bandage were applied.

An X ray taken through the plaster three weeks after operation showed that the position of the bone had not changed. After four and a half weeks the boy went to the Convalescent Home. Eleven weeks after operation the plaster was removed. Moderately firm union had occurred. The X ray showed the upper end of the fibula had been driven upward slightly into the medullary portion of the tibia. A new plaster was applied.

The boy was readmitted to the hospital in January 1906. At that time the union between the upper end of the tibia and the fibula had become absolutely solid and the shaft of the fibula had materially increased in thickness (Fig 3).

Five and a half months after the first operation a longitudinal incision was made anteriorly over the outer part of the lower end of the tibia. The bone was exposed. By careful dissection the lower end of the fibula was then exposed through the same incision and with a chisel it was split horizontally for a distance of

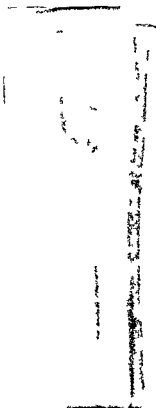


nearly four inches. Great care was taken to avoid separating the periosteum from either half of the bone. At the lower end of the split made in the bone the inner half was cut across transversely at the level of the upper part of the remaining lower epiphysis of the tibia. A small pocket was then cut in the cartilage covering the end of the tibial epiphysis just large enough to receive the inner half of the fibula. The inner half of the fibula was then sprung into its new position in the tibia. In doing so the outer half was broken at its upper end but was still held in place by the periosteum. The inner half remained intact and was retained in its new position by the tension of the muscles. The fascia forming the muscular sheath was sewed with catgut and the skin was closed without drainage. A sterile dressing and plaster of Paris bandage from the toes to the thigh completed the dressing. Three weeks after operation the child was sent home with the plaster bandage not disturbed. An X-ray showed that the bones remained in place.

After three months the plaster was removed. A small granulating spot was found at the lower end of the incision. Bony union was solid. Five days later a small spicule of necrotic bone about three-quarters of an inch long was discharged. After this the skin healed solidly. A month later the boy began to walk on his leg, and ever since has used it without restraint (Fig. 4).

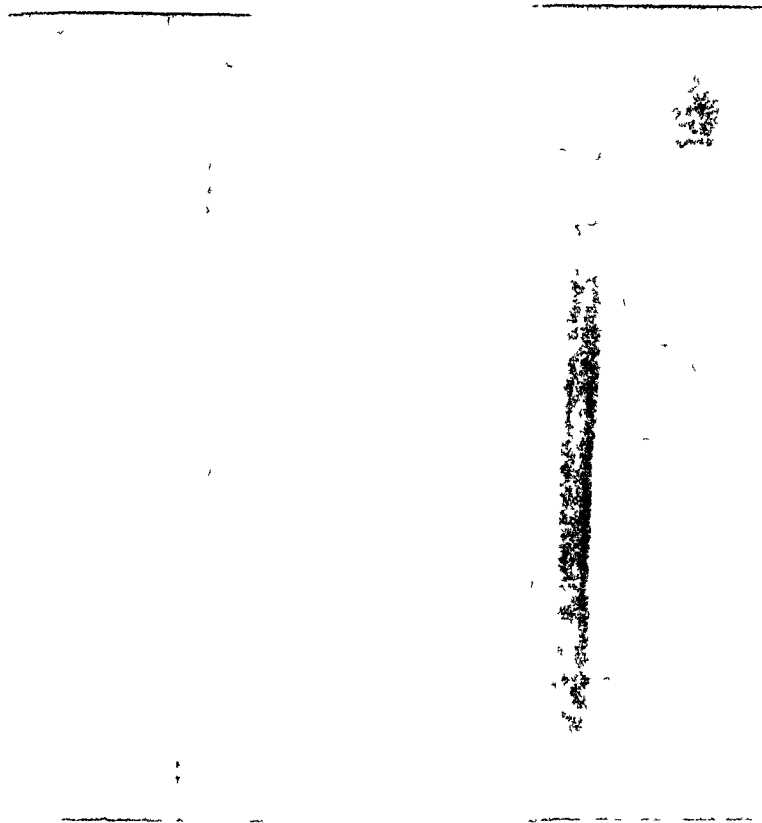
NOTE—For the series of radiographs which show the conditions better than words can express them I am indebted to Dr. A. W. George, the radiologist of the Hospital.

The problem presented in this case was the restoration to usefulness of a leg in which the fibula was sound, the upper end of the tibia was sound, and in which the lower epiphysis of the tibia remained, but without any shaft above it for a distance of 12 cm., nearly five inches. As might be expected a talipes varus was developing because of the lack of support for the inner side of the foot. The utilization of the fibula to take the place of the tibia seemed the obvious means of relief. The hypertrophy of the fibula, shown in the second set of radiographs, which came on when no weight was being borne upon the leg and when the boy was walking about with a Thomas knee splint, confirmed the hope that the hyper-



Rad graph k m f f th m l f th h f f th b Th m t  
f g rat w l l

FIG. 2



Antero posterior view

Lateral view

Radiographs taken a year after the removal of the shaft of the tibia. They show that no further regeneration of bone had occurred since the preceding X rays were taken. They show, however, the beginning hypertrophy of the shaft of the fibula, most pronounced about the middle.



A t o-p o t  
 Rad graph t ken fi m h fi h firs pers Sol l b l g h l m p  
 ti f fib l d ll ca f b



trophy would continue if the functional use of the bone were increased

The operative procedures especially in the first step were easy. The field of operation was made bloodless by a tourniquet which however was removed before the wounds were closed. The utmost care was taken to avoid injury to any nerves or vessels. In cutting across the upper end of the fibula great care was taken to avoid injury to the periosteum. In cutting out the mortise in the upper part of the tibia advantage was taken of an existing hollow in the bone but the utmost pains were taken in separating the periosteum to avoid tearing it. A side of the fibula bared of periosteum was placed in a freshly cut mortise in the tibia. Bare bone was thus placed next bare bone while periosteum was sutured to periosteum. A mistake was made in cutting the hole in the tibia a little too deep. The fear was that the fibula might not remain in its position. The fact was that the muscular pull crowded the bone upward into the medullary cavity. If the experience in this case is of value it would seem wise to cut the mortise only so deep that the cortical layer of the entering bone cannot sink inside the cortical layer of the receiving bone.

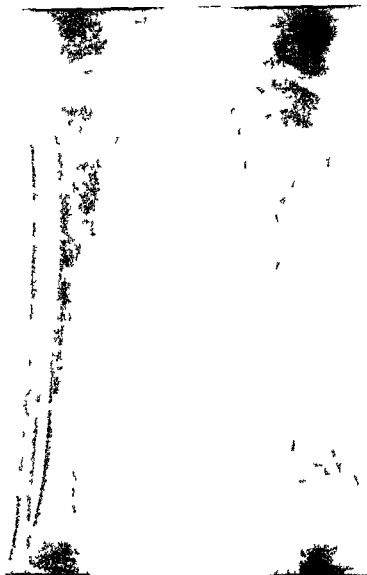
The second step was more difficult than the first. It was necessary to maintain connection between the shaft of the fibula and the external malleolus. If this was lost the outer side of the ankle joint would have been seriously weakened. At the same time it was necessary to bring a portion of the fibula above the lower epiphysis of the tibia. The greatest care was used in splitting the fibula. The periosteum was first cut with a sharp knife. Then in part with a small chisel in part with a stout knife the bone was divided. Each half of the bone had a thickness of only 4 mm. scarcely over an eighth of an inch yet in separating them for a distance of about three inches 8 cm. it was essential that the periosteum remain adherent to each portion and that an equal thickness of each part be maintained throughout. It was planned to spread the halves without breaking either. This proved impossible. Fortunately the outer rather than the inner half gave way

close to the upper end of the split between them. In another case it would seem wise to insure a break in the outer half at this point rather than run the risk of breaking the inner half or the outer half at a lower level. The promptness and the extent of the new bone formation from each of the halves were surprising. The trifling amount of necrosis was gratifying.

The continued increase in the size of the transferred bone is most striking, and corresponded in amount with the freedom of use which was allowed. The last radiograph (Fig 5) was taken after the boy had been using the leg for nine months without any restraint whatever and without any discomfort or disability at all.

In any similar case more prompt transfer of the bone would seem advisable. Nothing was gained by the delay. The length of time allowed between the steps of the operation might also have been shortened.

The result is one of perfect functional usefulness. There is a shortening of 4.2 cm. measured in the radiograph ( $1\frac{5}{8}$  inches) which corresponds with the ordinary clinical measurements. The lower ends of the tibia and fibula are growing symmetrically. While it is not possible to say absolutely how great an interference with growth there may be in the future the present indications are that it will be very slight and will not interfere at all with normal functional use.

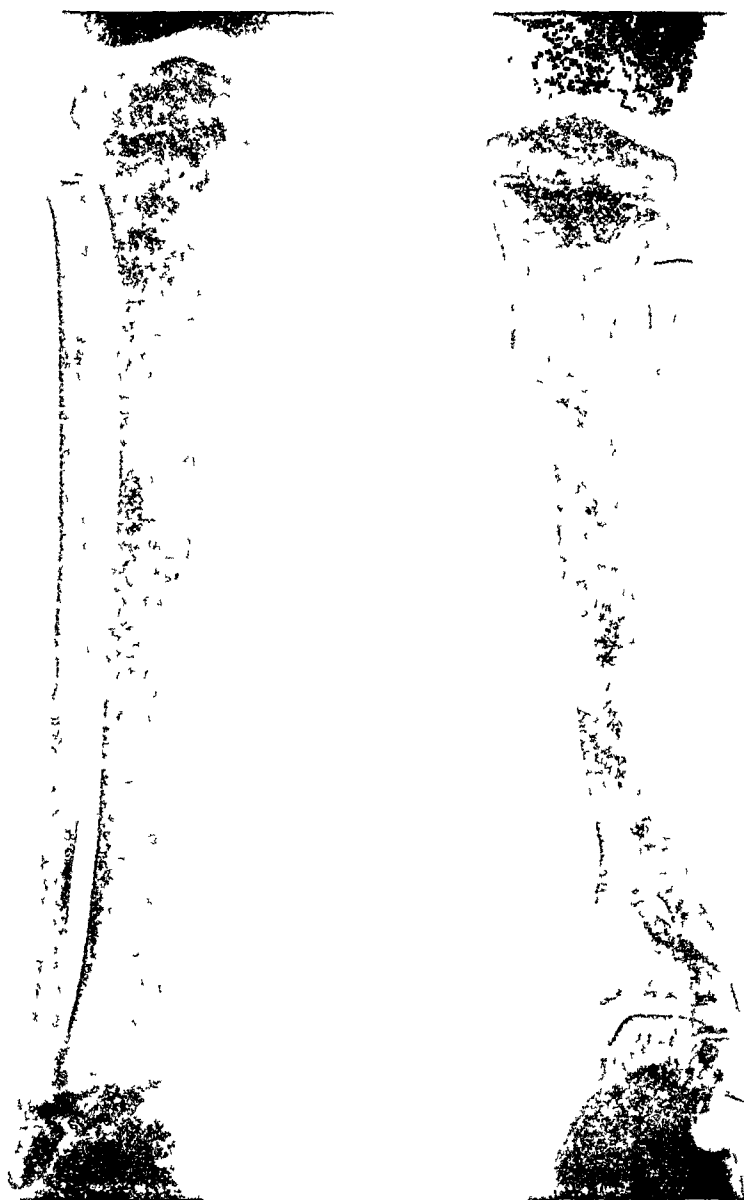


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 is h th l d fth bon j st bo h l v epiphys fth tibi



FIG 5



Radiograph taken in February 1907 two years and eight months after the removal of the tibia—nine months after the preceding radiograph. The tremendous increase in the diameter of the transferred fibula occurring under the stimulus of functional use is strikingly shown. Accurate measurements of the radiographs show that the tibia of the normal side has grown 11 cm. in length in nine months while the bone on the other side has grown 8 cm. in the same period. In other words, the interference with growth at the lower epiphyseal line of the tibia has been only 3 cm. in nine months. There has been no change in the relations between the lower epiphyseal lines of the tibia and fibula. There is no tendency toward the development of a talipes varus or talipes valgus.

# FRACTURE OF THE TARSAI SCAPHOID BONE

WITH REPORT OF THREE CASES

BY PHILIP H COOK M.D.,

OF WORCESTER MASS

Skiaqr ph W cest C ty d M m rial H pt !

FRACTURE of the tarsal scaphoid bone is of infrequent occurrence The standard text books on fractures do not mention it though Bloodgood writing in Saunders Medical Hand atlas recognizes fractures of the tarsal bones other than the astragalus and os calcis

Prior to the advent of the Rontgen rays Kohlhardt<sup>1</sup> reported a case of fractured scaphoid Later Bahr<sup>2</sup> recognized luxations of the bone and reported 7 cases The accuracy of these diagnoses is considered doubtful by later writers In 1905 Bergmann<sup>3</sup> described 3 cases and proved his diagnosis skiagraphically

The scaphoid bone situated at the inner side of the tarsus articulates behind with the astragalus and in front with the three cuneiforms The number of joints into which it enters combined with the important position of the bone in the plantar arch make injuries to it seriously disturb the integrity of the latter structure and render the prognosis very guarded

Fractures of this as of the other tarsal bones usually occur after falls from a height the patient landing on the toes with the foot in plantar flexion This indirect force transmitted from above presses the bone between the astragalus and cuneiforms and tends to drive it forward Owing to its bracing by the plantar ligaments its close articulations and its great dorso-plantar diameter the bone is usually crushed before this takes place Isolated dislocation has not been observed since cases began to be studied by the X ray With greater force the fragments slip forward under the tendons on the dorsum of the foot and the astragalus is pushed into their place.

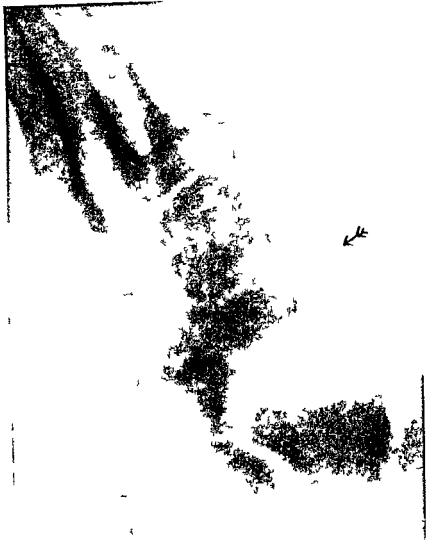
On physical examination the foot is seen to be swollen

and apparently broadened Bergmann, in his three cases, found shortening of the inner edge of the foot, amounting to about 0.75 cm. Tenderness and crepitus can usually be elicited anterior to and a little below the malleoli. In cases with dislocation, the displaced fragments can be felt as a prominent knuckle on the dorsum of the foot. The usual clinical diagnosis is fracture of the astragalus.

The best method of diagnosis is by skiagraph, taken as usual for lateral views of the foot, with the external malleolus resting on the plate. A fair view of the bone can also be obtained in the antero-posterior direction. The principal line of fracture is found, as a rule, to follow the long axis of the bone, the two resulting fragments being further comminuted and displaced forward or inward, following the lines of least resistance. The normal foot should also be skiagraphed for comparison. The importance of this is illustrated by Momburg's<sup>4</sup> case. Disability was claimed one year after a slight injury. A skiagraph showed the scaphoid to consist of two pieces. There was, however, no effort at callus formation, and a control picture of the other foot showed a smaller piece in a similar location. The patient being overweight and showing in addition flattening of the arch, on both sides, the symptoms were ascribed to this and the indemnity was not granted. This whole question of supernumerary bones in the tarsus requires further investigation. Another example is seen in the so-called "os trigonum tarsi."

Treatment should aim first at the reduction of the fracture. For this Bergmann recommends the following technique: under ether the toes are grasped and extended, the foot flexed plantarward and abducted. This manœuvre tends to increase the distance between the astragalus and the cuneiforms, and pressure on the dislocated fragments may now replace them. If the irregularities of the fragments make this impossible, Bloodgood<sup>5</sup> suggests an incision for reduction.

The apparatus used should have for its primary object the support of the arch. Bergmann rejects the complete cast as inapplicable on account of the swelling in early cases, and rec-



CAUTION: DANGER

Fig. 2



Case II — Note comminution and forward displacement of fragments

←





ommends a strong plantar splint of plaster extending from the toes over the sole to the upper third of the leg and well molded over the arch. Over this is applied a firm bandage with much wadding. This dressing allows of daily removal of the bandage for massage and bathing of the foot a procedure which this author considers very important. After firm union has been obtained a flat foot plate should be worn for a long period.

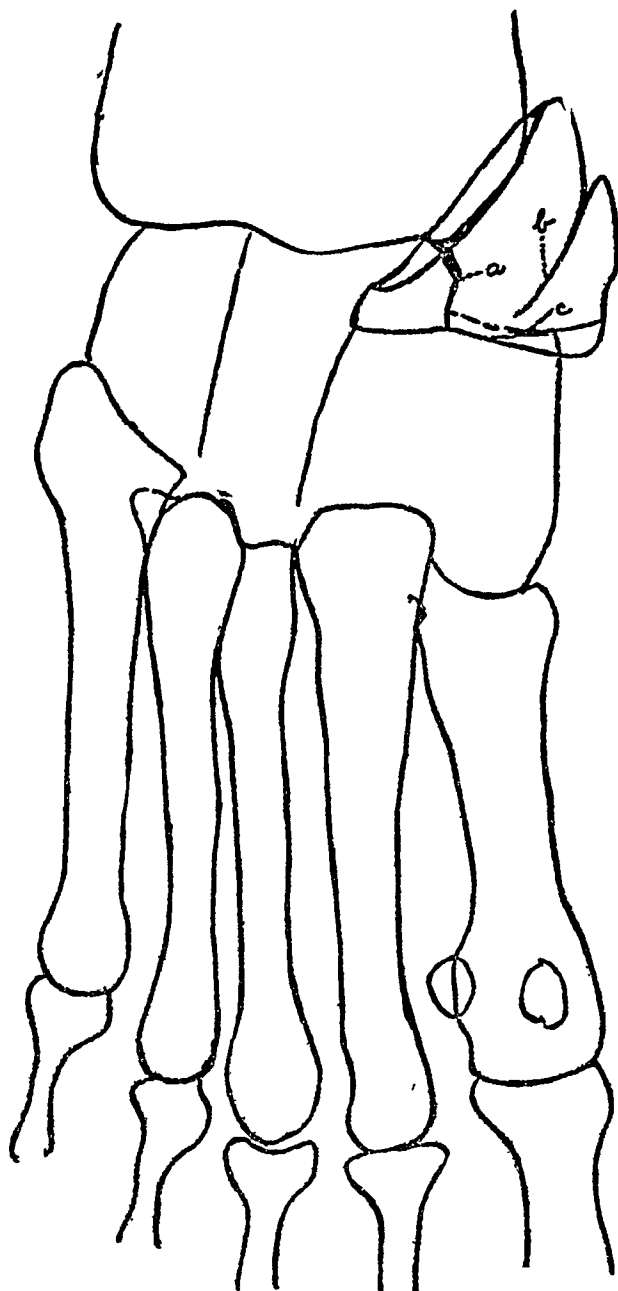
Prognosis should be guarded in every case. Traumatic flat foot with its accompaniments of pain edema and varying disability is very likely to develop. Especially in the unreduced cases the ultimate function is bad. It must be borne in mind that by this fracture the capability of two of the great weight bearing joints of the foot the talo-navicular and naviculo cuneiform is practically destroyed.

CASE I—C H B lineman aged 30 fell from a telegraph pole in October 1905 landing heavily on both feet. He was brought fourteen miles to the Worcester City Hospital where a few days later skiagraphs were taken. These showed on the right a badly comminuted ankle joint tibia fibula and astragalus all being involved. On the left the scaphoid was broken into several pieces and driven forward under the tendons on the dorsum of the foot the astragalus being shoved forward to take its place. Treatment consisted in reduction and immobilization in plaster continued six weeks. Toward the end of this time flat foot plates were applied to both feet. On December 17 the patient left the hospital the record stating Motions at ankle good and I have been unable to trace him. If this case were seen fresh to day I should recommend Bloodgood's operation (Fig I).

CASE II—N F teamster aged 23 stepped backward into a hole in a roof and fell about 20 feet to a pile of bricks striking on both feet with knees semi flexed on October 28 1906. The left ankle at once became swollen and painful and he was taken to the Worcester City Hospital where swelling ecchymosis tenderness and crepitus below the malleoli were noted and a diagnosis of fractured astragalus made. A skiagraph taken next morning showed the following condition. Scaphoid comminuted with slight forward dislocation of fragments. Astragalus pushed slightly downward (Fig II).



FIG 4



Case III —Antero posterior view (tracing) (a) Principal fracture line (b, c) Lines of fissure

Plaster was applied and continued for about four weeks after which patient was allowed to use his foot

On February 14 1907 three and a half months after the injury his condition was as follows. Marked thickening at the site of the bone on the dorsum and inner side of the foot apparently due to callus formation. Motions at the ankle are free and painless except inversion which causes some pain. Patient says that the foot easily becomes tired. After a hard day's work it becomes edematous and cyanotic and the veins become prominent. Pain appears at the site of the fracture sometimes radiating up the leg and severe enough to interfere considerably with his present work as collector.

A skiagraph taken at this time showed the bones about as in the first one with some loss of detail probably due to callus. A flat foot plate designed to hyper correct the evident flattening of the arch was applied with immediate and continued relief. The patient is still wearing it (May 4).

CASE III.—J. J. nurse aged 21 leaped from a window in a fit of melancholia on March 4 1907 striking with both feet on the frozen ground. She afterward complained of pain in the right foot and a bandage was applied but little else was done until four weeks later when Dr. B. T. Burley was called as consultant on the nervous symptoms. He examined the foot and having heard cases I and II reported before a local society made the clinical diagnosis of fractured scaphoid. By his advice the patient was sent to Memorial Hospital and skiagraphs taken (Figs. III and IV). Physical examination showed marked tenderness on the dorsum and inner side of the foot over the site of the bone. No crepitus could be elicited.

The skiagraphs showed the longitudinal fissure line with unusual distinctness there being also some comminution of the fragments.

A plaster cast was applied from the toes up and worn two weeks when it was replaced by a bandage. At the present writing (May 4) the foot appears normal but the patient is still on crutches and refuses to put it to the floor. The mental condition renders careful examination difficult.\*

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July 27. Patient's mental condition has improved and she reports foot as well as ever except for swelling after unusual exertion. Is wearing no apparatus.

I am indebted to Drs Homer Gage, Marsh, and Burley for the privilege of reporting these cases, which occurred on their services. The histories are compiled from the records of the Worcester City and Memorial Hospitals.

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- <sup>1</sup> Kohlhardt Seltene Verletzungen der Fusswurzel
- <sup>2</sup> Bahr Volkmann's Vortrage, 136
- <sup>3</sup> Bergmann Deutsche Zeitschrift fur Chir, 1905, lxxviii, 199
- <sup>4</sup> Momburg Arch fur klin Chir, 1905, lxxvii, 295 Cited by Bloodgood  
in Progressive Medicine, Dec, 1906
- <sup>5</sup> Bloodgood Loc cit

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY

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*Stated Meeting May 8 1907*

DR JOSEPH A BLAKE President *pro tem*

### STAB WOUND OF THE SPINAL CORD

DR WILLIAM G LE BOUTILLIER presented a boy seventeen years old a plumber who was admitted to the J Hood Wright Hospital on March 27 1907 in the service of Dr Howard D Collins with the history that shortly before his admission during a quarrel he was stabbed in the back of the neck. He dropped to the pavement but did not lose consciousness.

The boy was immediately brought to the hospital and upon examination he was found to be conscious but in a condition of considerable shock. He was unable to move either his arms or his legs. There was a small incised wound in the left occipital region. This wound from which only a few drops of blood had escaped was probed by the assistant house surgeon and he stated that the probe passed along the occipital bone and then downward and inward to a depth of about four inches extending to the cervical vertebrae. The wound was about half an inch in length. When Dr Le Boutillier came on duty there was still complete paralysis below the clavicle. The pupils were equal and reacted to light and accommodation. There was no strabismus nor facial paralysis. The tongue did not deviate. The voice was husky and the patient could not speak above a whisper. There was no impairment of deglutition nor articulation. There was no bleeding from the ears nose or pharynx. The left trapezius and sterno-cleido mastoid muscles were paralyzed and the patient was unable to move his neck. The head was drawn slightly to the right side. There was paralysis of the external respiratory muscles on the left side. The patient breathed entirely

with the right side of the chest. There was no diaphragmatic respiration on the left side. There was complete flaccid paralysis of the left arm and leg, with spastic paralysis of the right arm and leg. The knee-jerk and cremasteric reflexes were absent on the left side, about normal on the right side. There was no loss of tactile sensation on either side of the body or in the extremities. No priapism. No apparent injury to the vertebral column was determined. Abdominal and thoracic viscera negative. Temperature on admission, 97.8, pulse, 84, respirations, 26.

The patient was kept in bed, and external heat was applied. He twice vomited small amounts of undigested food, but complained of no pain. From the onset, defecation and micturition were involuntary. For the first few days after his injury, there was no noticeable change in the symptoms, except profuse frothy expectoration lasting about a week. The wound in the neck healed on the second day. On April 2, the patient had complete loss of motion as noted above. He responded to touch everywhere equally well. Temperature and pain sensations were somewhat disturbed, especially on the left side of the body. Along the upper part of the neck and under the chin there was quite a definite area of hyperæsthesia. On the upper left part of the occipital region there was a small area, about two inches in diameter, of apparently absolute anæsthesia. There was some dysphagia, and inspection showed some paralysis of the pharyngeal muscles. The right pupil was larger than the left.

On April 8 the patient's general condition was good. There was no decubitus. There had been no improvement in the paralysis. The reflexes which had hitherto been absent, were now present and exaggerated. About April 17th there was beginning return of voluntary motion in the feet and fingers. On April 26th the patient first became conscious of a desire to urinate, and he began to acquire slight power in its control. Defecation was still involuntary. He was now able to flex the right leg to a right angle with the thigh, and the left forearm nearly to a right angle. Power to rotate the legs was slight, but equal. The power of grasp in each hand was very slight, and apparently equal. The patient now responded accurately and normally to pain and temperature stimulation on the left side of the body, but there was still considerable confusion on the right side.

On May 2, 1907, with some slight support to the arm, the

patient could now carry his left hand almost to the mouth. The ability to extend the hand was not so good. The right thigh could be well flexed on the abdomen and the leg on the thigh. Power in the right arm and left leg was only slightly increased and was very weak compared with that in the other two extremities. There had been no trophic disorders at any time and the general condition of the patient was excellent.

DR JOHN A. HARTWELL, in speaking of the differential diagnosis between a direct stab wound of the spine and hæmorrhage in the case shown by Dr Le Boutillier, said there were several points that favored the latter view. He could recall three cases in which a diagnosis of subluxation of the spine had been made on account of immediate paralysis following the injury in which the symptoms subsequently proved to be due to hæmorrhage. In all those cases the paralysis was almost instantaneous and the fact that Dr Le Boutillier's patient was immediately paralyzed did not throw out the diagnosis of hæmorrhage.

The second argument against a possible severance of the cord in this case was the rapid improvement. This had occurred within three weeks, which was much sooner than would have been expected even after the suture of a nerve with a neurilemma, while it would certainly be unusual in the spinal cord, which had no neurilemma upon which regeneration depended.

Dr Hartwell said the direction of the stab wound in this case was also inconsistent with the idea that the cord itself was wounded. He was inclined to attribute the paralysis to the pressure effects of a hæmorrhage. The unusual distribution of the sensory symptoms also suggested the possibility of a neurosis.

DR THEODORE DUNHAM referred to one case coming under his observation in which the symptoms were somewhat similar to the one shown by Dr Le Boutillier. The patient was a boy of nine years with a spina bifida. He had had several attacks of paralysis of varying degrees, the effects of which had passed off in the course of time. One day, while seated in a wheeled chair, he suddenly fell out, and when he was picked up he was almost completely paralyzed, although he still had control of one arm. He was brought to the hospital and for three or four days was in a more or less stupefied condition, and when that passed off his paralysis was still more evident. After about three weeks there was slight motion in the paralyzed limbs, in which he had

since then gradually regained power There was no history of trauma, and the case was regarded as one of hæmorrhage into the cord

### STRANGULATED INGUINAL HERNIA IN A SEVEN WEEKS' OLD INFANT

DR LE BOUTILLER presented a boy, seven weeks old, who was admitted to the J Hood Wright Hospital on April 22, 1907, at 5 30 P M, with the history that he had a "lump in his groin" The mother stated that on the day prior to his admission he had had no stool and had cried considerably, as though in pain Upon examination she found a swelling in the right groin which seemed tender Toward evening the child began to vomit and continued to do so at intervals during the night and the following morning

Upon examination at the hospital, the abdomen was rather rigid, and in the lower right inguinal region there was a slight fulness extending over Poupart's ligament and down into the scrotum, which was swollen, reddened and tender The mass itself was fairly soft, and felt as though it contained fluid or gas, and was apparently connected by a pedicle with the abdominal cavity

The patient was immediately removed to the operating room, and a three-inch incision was made from just below the anterior superior spine, passing obliquely downward to just below the inner part of Poupart's ligament The skin and fascia were retracted, and the protruding hernial sac freed from the cord and opened It contained no fluid, but about five inches of small intestine, which was adherent to the end of the sac The adhesions were broken up, and a small area of the gut, about one-quarter of an inch in diameter, which was lustreless, black and almost gangrenous, was inverted with Lembert's sutures, so that the knuckle made by turning in the affected area ran transversely to the long axis of the gut The gut was then returned to the peritoneal cavity and the sac excised, one chromic catgut suture being inserted to approximate the aponeurosis about the external ring The wound was closed with interrupted sutures

Following the operation, the child was restless and cried a good deal during the night, and had several slight attacks of vomiting On the afternoon of the day following the operation the temperature suddenly rose from normal to 104, and then

as rapidly returned to normal. The wound healed by first intention and after the first day the child nursed and slept well and seemed comfortable. The bowels moved regularly once or twice daily and there was no evidence of any intestinal discomfort or trouble. The patient was discharged cured on April 27 1907.

#### A PRELIMINARY REPORT ON THE TREATMENT AND CURE OF CANCER BY THE USE OF THYMUS GLAND

DR. FREDERICK GWYER read a paper with the above title for which see page 86.

DR. BLAKE after examining the patient said there was still a distinct mass over the clavicle and another in the left pectoral region.

DR. JOHN ROGERS said he had had quite a little experience with the use of these foreign substances and one serious difficulty he had encountered was that a human being would acquire immunity to calf thymus in a moderately short period of time and it was necessary to increase the dose rather rapidly.

DR. GWYER said the tumor in the pectoral region referred to by Dr. Blake was an enlarged gland which was formerly as large as his thumb but had now almost disappeared. The other mass might possibly be fat.

In reply to Dr. Rogers the speaker said that while perhaps a patient might acquire tolerance to the administration of the gland he thought that point would not be reached before the onset of the auto intoxication which would necessitate an intermission in the course of the treatment. During this period of rest it was probable that the acquired tolerance would again be lost and treatment would again become effective. Personally Dr. Gwyer said he had not seen this acquired tolerance in any of the cases in which he had given the thymus. The gland seemed to have a selective action on the cancerous growth and he knew of no other remedy or treatment which produced such a rapid and marked change in the clinical appearance of the lesions. A month ago some of the enlarged glands in the case he had shown were visible across the room to-day they could scarcely be felt.

#### TUBERCULINS AND THE TUBERCULO OPSONIC INDEX.

DR. THEODORE DUNHAM read a paper with the above title for which see page 596.



DR ROGERS said he had employed this method of treatment to some extent in tubercular cases, and was very well satisfied with it. There was considerable difference of opinion in regard to the value of the opsonic index, and for a long time, Dr Rogers said, he had shared in the feeling of scepticism regarding it. Since then, however, he had had practical evidence of its efficacy in a case of tuberculosis of the glands which had previously been operated on a number of times, and in which the glands rapidly disappeared under the use of tuberculin. There were many cases of tuberculosis of the glands and bones and joints and some of visceral tuberculosis which were perfectly hopeless from a surgical point of view, and it was in that class of cases that this treatment should be given a thorough test. The speaker said he had resorted to it in two cases of Pott's disease, with psoas abscesses and discharging sinuses, fever, etc. He began by giving these children a solution which was made by mixing 0.000001 gm of ground tubercle bacilli (Koch's "TR") in 1 c.c. of sterile water. Of this mixture a dose of 1 minim was given on the first day, and increased 1 minim each day. The opsonic index was not taken, and the speaker said he did not think that was necessary. In these two cases the dose was gradually increased, and by the end of the second week the discharge from the sinuses had almost entirely ceased. A week later the children were up and running about the wards, and showed other signs of improvement, although the sinuses had not entirely closed.

It was very necessary in these cases, Dr Rogers said, to keep track of the temperature, because with an elevation of the temperature the symptoms became aggravated and the discharge from the sinuses increased.

DR BLAKE said it was well known that the treatment of pulmonary tuberculosis with tuberculin had been carried on for some time without the help of the opsonic index for the purpose of determining the proper dose, and very good clinical observers had made the assertion that it was not necessary to have the opsonic index in order to determine the amount of tuberculin to be given. He referred to a case of mixed tubercle and staphylococcus infection of the cervical lymph nodes where the tissues had become undermined with burrowing sinuses in which a thorough course of treatment with vaccines had had no effect whatsoever.

DR DUNHAM said he had treated a number of tuberculous children with tuberculin in small doses without taking the opsonic index and they had all done surprisingly well as regarded their general health. One was a rather bad case of tubercular peritonitis which had been operated on several times and which afterwards did exceedingly well under the tuberculin treatment. He had also tried the method in cases of tuberculosis of the joints and in tubercular sinuses. He had become quite enthusiastic regarding the treatment and had a strong feeling that it could be carried out almost as well without the opsonic index as with it. While the determination of the opsonic index was very desirable the process was a laborious one certainly in hospitals where a number of these cases were under treatment. In dealing with obscure cases the recognition of tuberculosis by the opsonic index would be exceedingly useful.

#### AN INFLAMED APPENDIX REMOVED FROM A STRANGULATED INGUINAL HERNIA

DR LE BOUTILLIER showed a specimen which he had removed from a twelve weeks old baby who had a congenital right inguinal hernia which had become strangulated. The hernial sac was found to contain cæcum and an inflamed appendix which was about an inch and a half long.

The history of the case was that the hernia had been irreducible for about ten days. The hernial tumor was about the size of a walnut. The abdomen was distended and tender and there was fever and vomiting. Three days before operation the attending physician had succeeded in reducing the hernia but in spite of this the symptoms of vomiting and pain persisted. The hernia again descended about eight hours before the operation was done and the scrotum was exceedingly red and tender. Recovery was uneventful.

## BOOK REVIEWS.

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SURGERY OF GENITO-URINARY ORGANS By J W S GOULEY,  
M D, New York City Rebman Company, New York, 1907

After fifty years of surgical work, dealing with a class of patients in Bellevue Hospital in which urological disease is rampant, Dr Gouley has gathered together in this volume the experience of these years Dr Gouley has written many papers upon various subjects but this is the first book which has been published by him To the beginner in the study of the diseases of the genito-urinary organs, the book is of special value because it treats of the subject almost entirely from a clinical standpoint The work consists of brief annotations on the nature, diagnosis and treatment of some of the diseases of the genito-urinary organs that come within the province of surgery The book is by no means a systematic treatise on genito-urinary surgery, it treats simply of the surgical diseases of the urethra, prostate and bladder, and is practically a collection of the papers read and published by the author at various times during the course of his work The book is delightful reading to one interested in this branch of surgical endeavor and it abounds in truths and practical suggestions, although the domain of the clinical pathologist has been sadly but purposely neglected Those who are entering upon this work would do well to pause and read the conclusions of a surgeon of Dr Gouley's vast experience

PAUL PILCHER

SURGICAL DISEASES OF THE CHEST By CARL BECK Philadelphia P Blakiston's Son & Co, 1907 ix, 371 pp Illustrated 8vo

A review of the book naturally falls into three portions —

- 1 The Anatomy
- 2 Those surgical conditions that occur in this region but also in other parts of the body
- 3 The conditions that occur in the chest region exclusively and merit a special treatise

The author devotes one seventh of the book to anatomy. This part conforms to the standard text books on anatomy and the illustrations are from Morris.

The second part takes up in a superficial way such diverse subjects as Hodgkins disease spina bifida kyphosis fractures carbuncles burns etc and the ordinary details of the sterilization of the surgeon's hands. The author also considers subphrenic abscess and cervical rib which are not strictly diseases of the chest.

In the third portion of the book to which the surgeon naturally turns the subject of pyothorax is treated at length. The author advises the use of his special periosteotome rib shears and pleural speculum. After a subperiosteal resection of the rib and slow evacuation of the pus he introduces the finger or sponges on holders or a blunt spoon through the pleural speculum into the pleural cavity to remove all fibrinous masses and irrigates with salt solution. He then stitches the costal pleura to the skin with four silk sutures and packs the cavity with several yards of a narrow strip of 3 per cent iodoform gauze dispensing with the use of rubber drainage tubes. Then follow an extensive argument to prove that his method is more satisfactory than those in general use in the ordinary acute cases.

For chronic pyothorax he gives the history of the development of the more radical operations now employed to combat this condition. The other surgical intra thoracic diseases he treats in brief.

The book closes with a consideration of the diseases of the mamma.

The X ray illustrations are in part new and in part from the author's recent work on the Roentgen Ray in Diagnosis.

WALTER C. WOOD

## CORRESPONDENCE.

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### FRACTURE—DISLOCATION HEAD OF HUMERUS

TO THE EDITOR OF THE ANNALS OF SURGERY

SIR —It may interest your readers to know in reference to Dr Keen's case—June, 1907, p 945—of fracture of the anatomical neck of the humerus with dislocation of the head into the axilla, that in 1893 I recorded two cases in the Transactions of the Pathological Society of London, Vol XLIV, p 128

The head in each case was removed from the axilla by operation—one by Mr Croft and one by myself, and both specimens are now mounted in the Museum of St Thomas's Hospital The illustrations published in the Transactions are almost identical with that of Dr Keen's published in the ANNALS OF SURGERY for June, 1907 In 1893 we had not the advantage of the X-rays, but there was not the slightest difficulty in recognizing the nature of the injury

Yours faithfully,

July 26, 1907

H H CLUTTON,  
2 Portland Place, West,  
London, England

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### EDITORIAL NOTE

#### POPLITEAL THROMBUS

The figure on page 347 "showing thrombus in popliteal artery" should have been inserted on page 363

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## CATARRHAL CHOLANGITIS

Charles Gilbert Davis, M D, Chicago, Professor of Surgery and Gynecology, Lakeside Post-graduate School, Attending Surgeon, Lakeside Hospital, Consulting Surgeon, City Emergency Hospital, Former Attending Surgeon, Cooke County Hospital, reports on the treatment of catarrhal cholangitis and cholelithiasis with pills similar to Bauermeister's probolin, i. e. consisting of acid sodium oleate, salicylic acid, phenolphthalein and menthol.

The use of salicylic acid in pathologic conditions of the liver he began twenty-five years ago, and he found it particularly satisfactory in combination with the other drug, as a cholagogue and an antiseptic whose effect is prolonged throughout the alimentary tract. Many cases which are ordinarily considered amenable only to surgical interference can be satisfactorily treated with the pills, and he believes that under their use cholangitis, with and without stones, will ultimately cease to be a surgical condition.

He relates six typical cases in which he found the combination effective, not as a purgative pill, but more especially as a cholagogue, a concretion solvent, and a biliary disinfectant. The menthol and the phenolphthalein produce and regulate intestinal activity, and the salicylic acid and the oleate have a decided antiseptic and powerful cholagogue action.

As to diet, he does not restrict the same too closely, but interdicts all foods known to be difficult of digestion, and all alcoholic beverages. The principal point to be observed is to insist that large draughts of hot water be taken with the pills, for the purpose of diluting the excretions and assisting in breaking up any concretions present—Abstracted from *The Therapeutic Gazette*, July 15, 1907.

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## THE USE OF ADRENALIN DURING ETHER ANESTHESIA

By CHARLES S. VENABLE, M.D., Charlottesville, Va.

Recognizing that my experience in the use of Adrenalin during ether anesthesia is but very limited, covering a course of only eighteen cases, and knowing the many fallacies attendant upon too early conclusions, I feel a great hesitancy in making this report. However, owing to the uniform result that has attended its use, I am prompted to do so now.

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"No," replied the manager sadly, "they were too sleepy."

—October Lippincott's

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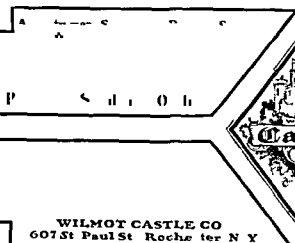
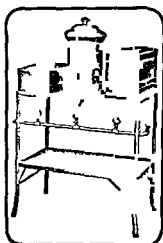
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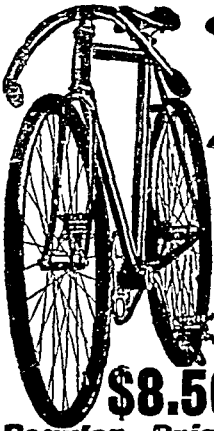
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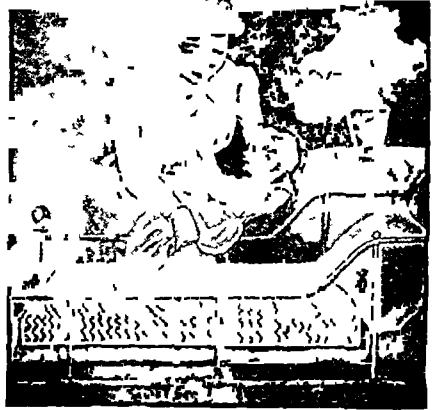
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Besides his general score of merit, Dr. Kassabian is interested in the study of the American Medical Association and the Röntgen Ray Society and is a delegate to the International Congress of Physiotherapy and to the International Congress for the study of Radium and Ionization.

A glance at the title of this book is enough to show that it is a complete and up-to-date medical dictionary of the X-rays and all its subjects.

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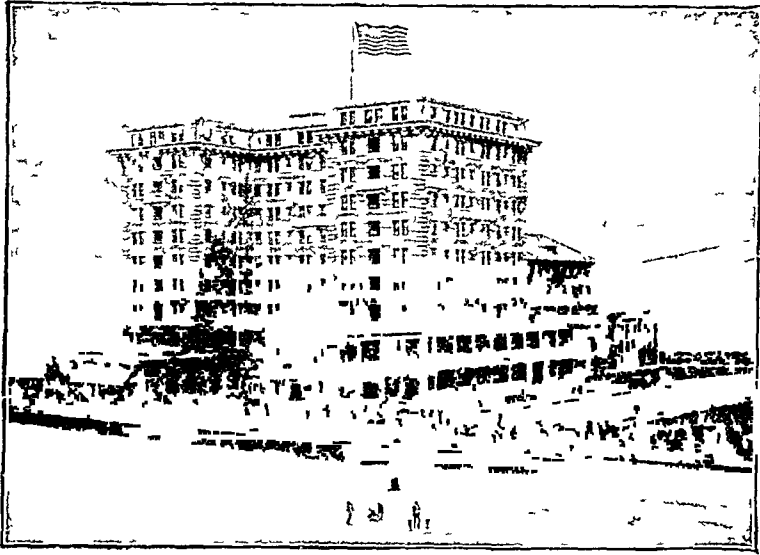
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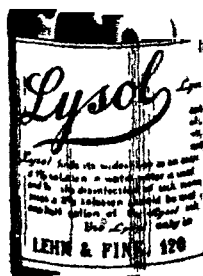
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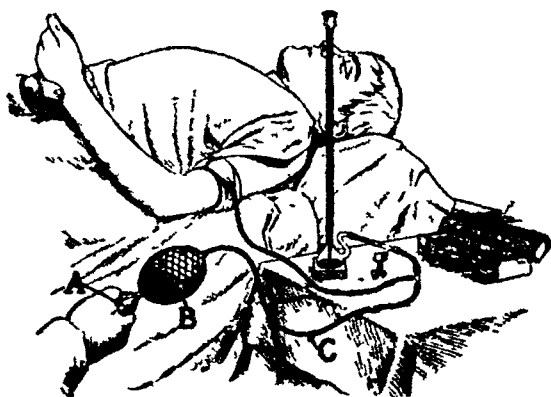
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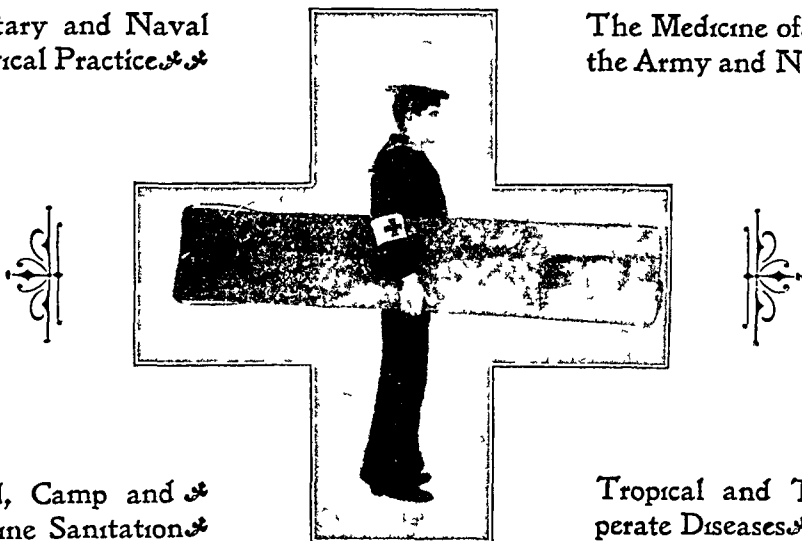
EDITED BY

James Evelyn Pilcher, M.D., Ph.D., L.H.D.,

Major and Brigade Surgeon of United States Volunteers,  
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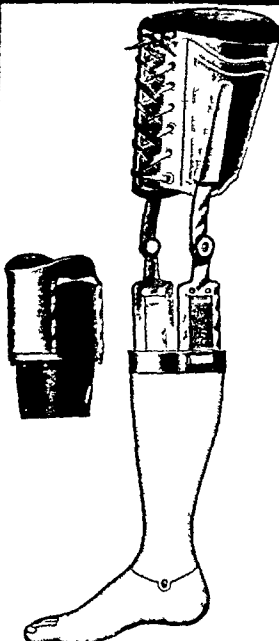
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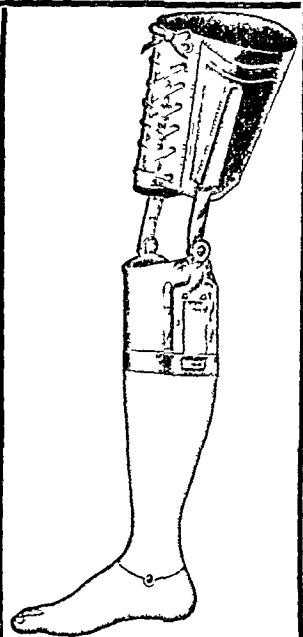
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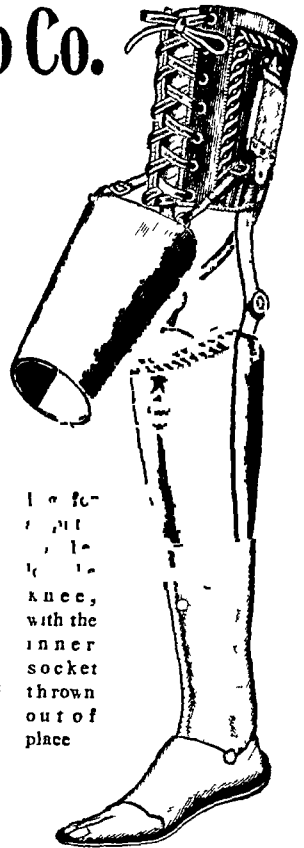
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ANNALS OF SURGERY

VOL XLVI

NOVEMBER 1907

No 5

ORIGINAL MEMOIRS

MULTIPLE CARCINOMATA FOLLOWING CHRONIC X RAY DERMATITIS *

BY CHARLES ALLEN PORTER M D.,

OF BOSTON MASS

Surgeon to the Massachusetts General Hospital

AND

CHARLES J WHITE M D

Instructor in Dermatology at Harvard Medical School

THE recent death of Prof Fuchs of Chicago from metastatic X ray carcinoma leads me to report in detail the history and present condition of another case of multiple epithelial carcinomata which has been under my care since 1897

In delaying this report until the present time I have been greatly influenced by my personal regard for the patient but the above case the fourth fatal one in the United States and a slowly increasing list of undoubted instances of X ray carcinoma here and abroad makes it imperative that the attention of dermatologists and surgeons should be thoroughly aroused to the great danger of all persistent X ray ulcerations and especially to those which have followed with a few years interval the chronic skin lesions of the earliest operators

The first published account of the injurious effects of the X ray with which I am familiar was a paper by Marcuse

Read by title at a meeting of the American Surgical Association held at Washington May 1907

"Dermatitis und Alopecie nach Durchleuchtung mit Röntgenstrahlen" in the *Deutsche med Wochenschrift*, No 30, 1896

From 1897 the literature of this subject has grown each year. The earlier articles dealt with the immediate effects of the X-rays, dermatitis and burns, then it soon became recognized that these lesions were most excruciatingly painful and extremely slow to heal, further experience showed that some lesions closed with great difficulty only to break down again and again, and finally formed chronic ulcers—then came the first report of cancer developing in a chronic ulcer, and finally the first death from metastatic carcinoma.

In an excellent article written by Dr Richard Muhsam, and published in the *Archiv für klinische Chirurgie*, 1904, No 74, "Über Dermatitis der Hand nach Röntgenbestrahlung" may be found a full bibliography of the literature up to that time and a brief résumé of the histology of the characteristic lesions with which we are unfortunately too familiar.

CASES OF X-RAY CANCER

I and II—In 1903 Sick reported two cases, both in X-Ray operators, the first, after years of severe changes in the skin of the arms, neck and face, finally developed an ulcer upon the back of the hand, which soon took on the typical appearance of a carcinoma, and required amputation at the shoulder joint.

The second, with similar skin lesions of six years duration, also developed a chronic ulcer on the hand, which was excised and showed upon microscopic examination the typical picture of a skin canceroid, with cancer nodules in the cutis—the material from these cases was examined by Unna.

III—Dr Blacker of England, mentioned in *Medical Record*, Oct 22, 1904, for a long time suffered from an X-ray burn of the hand which was neglected till the cancer which had developed had extended up the arm and involved the axillary glands, when it was too late for operation.

IV—Clarence Daly. Personal communication from Dr Samuel Lloyd of New York and Dr W B Graves of East Orange, N J.

This patient was very seriously burned on both hands years before, in working with X-Ray tubes. He was treated at many different hospitals. Skin grafting was tried without result, until finally epithelioma developed on the right hand and on the base of the little finger of the left hand. At the time of Dr Lloyd's first examination the right hand was infiltrated with carcinoma and the axillary glands were involved.

The arm was amputated at the shoulder joint and the glands above and below the clavicle removed. Amputation of the left hand was advised but refused. This was August 8 1902 The ulceration gradually increased in size and depth and the left arm was amputated by Dr Graves on March 16 1904 Death followed from mediastinal recurrence in October 1904.

V—Epithelioma of finger of X ray machine manufacturer (communication from Dr Lloyd)

VI—Personal communication from Dr W B Coley Surgeon of Rochester New York. For five years had been using X Rays continuously Ulcerations present for six months on the backs of both hands specimens from which were examined by Dr Welch and found to be undoubted epithelioma. Amputation of right hand above wrist and thorough excision of ulceration on left hand October 10 1904. Subsequent recurrence in axilla and death

VII—Bertha Fleishman San Francisco death Quotation from New York Sun April 24 1907

VIII—Foulterton's Case *Lancet* May 6 1905 At a meeting of the Pathological Society of London Foulterton reported the case of a surgeon who began systematic work with the X rays in 1897 In May 1903 had a severe attack of dermatitis blistering of the skin on back of index and middle fingers of left hand ulcers resulting healed in about four months New skin was thin and tender and showed nevoid looking patches The nails fell out and the ones were hard and brittle. In December a second attack of dermatitis again caused ulcers on first and second fingers Ulcers on index finger remained open and in April 1904 began to assume a malignant character In September of that year finger was amputated at the metacarpophalangeal joint Sections of index finger showed typical squamous celled cancer

IX—Personal communication from Dr L L McArthur of Chicago dated April 26 1907 Patient was the first photographer to develop X ray plates in America. He early developed the chapped and fissured hands which go with the exposure to the ray especially in those who combined the development of their plates with their X ray work. For the last three years he has been having from time to time minor surgical procedures in the way of removal of a phalanx now and then, until three fingers of the right hand and two on the left had been sacrificed. After various plans of local treatment and a trip to Europe in search of remedial agents he came to me for the first time with an enormous axillary involvement. This was indubitably squamous celled carcinoma. The radical operation with removal of portions of the pectorales and a dissection of the axilla en bloc failed to effect an arrest of the trouble. Recurrence took place very promptly and within three months again filled the axilla and involved the supraclavicular glands. Deeming it hopeless to subject him to further surgical interference trypsin injections were given with a resulting liquifaction of the axillary mass to a nonpurulent sero-sanguinolent fluid containing immense masses of epithelial cellular detritus as was shown on opening and draining the same.

After lingering for six weeks he finally succumbed to a multiple metastasis on April 23, 1907."

X—"The second case was that of a physician who combined his electrical therapeutics from his static machine with the taking of pictures of his surgical cases. He, too, developed his own plates and constantly had his hands stained with the photographing solutions. He had the usual history of a chronic dermatitis with ulcerative processes that refused to heal, and required removal of the terminal phalanges on his left index and middle fingers. When he came to me it was with a typical epithelioma on the remains of the left index finger, and numerous senile keratoses on the back of both hands. I amputated the finger, which microscopic section demonstrated to be carcinomatous. I removed by a deep shaving-like cut the senile keratoses and grafted the same. I secured primary union in the grafts, had a mild infection along the stitch line in the amputation and an aseptic result in the axilla which I cleaned out radically though no glands were distinctly palpable at the time of the operation. No metastases were found in those lymph glands removed from the axilla which were examined. At present he is in good health."

From a careful search through the literature and some personal inquiry these ten cases of undoubted X-ray cancer are all which I have been able to find. I have purposely excluded a few recorded cases of carcinoma developing in lupus tissue after Rontgen treatment, and one or two cases of epithelioma, following burns, for I wish to limit the question under discussion to cancer resulting in the X-ray operators who for years have followed their work in spite of previous inflammations of the skin and persistent lesions.

If my case be included, there are eleven cases, of which five have proved fatal, and as one of Sick's, reported in 1903, had to submit to a shoulder joint amputation, it is probable that this result was also a fatality. The prognosis in X-ray cancer would therefore appear appalling if it were not for the very great likelihood that all fatal cases have been published while no record has been made of the much larger number of sufferers, who after excisions or minor amputations have as yet shown no evidence of recurrence. Though it is obvious that surgeons will very naturally hesitate, in the case of a brother physician, to add publicity to misfortune, there are so many unfortunates throughout the country, suffering from chronic lesions of all grades of severity, that it is now a duty

I think for all who have charge of these cases to publish their experiences in order that our knowledge of this difficult subject may be increased

The case which I have to report is that of an X ray operator who as a *young man* first began X ray work with a large static machine in March 1896 after October of the same year a powerful twelve inch coil was used Exposure lasted for several hours each day at a very *short distance* from a *low vacuum* tube About the middle of November hands became red and dry and in a few days very painful and greatly swollen Under black wash the dermatitis subsided but the finger nails first became dry and striated then softened and finally sloughed off (the patient felt convinced that this condition of the nails was greatly aggravated by the use of chromic acid in development of the X ray plates) In spite of the fact that one per cent orthoform ointment had to be used almost continuously to relieve the intense pain work was continued until April 1 1897 when the onset of another very severe dermatitis with the formation of enormous blisters and pain beyond description necessitated ward treatment for a month White wash gave considerable relief All forms of treatment by ointments powders and washes which Prof J C White could suggest proved useless the chronic ulceration which now involved most of the backs of the fingers of both hands refused to heal Orthoform ceased to relieve the pain At the suggestion of the patient Reverdin grafts were applied on July 10 1897 to the tip of the left forefinger which presented the appearance of a sluggish ulcer with rather exuberant granulations and unhealthy looking edges These pin point grafts took and grew Accordingly on August 13 1897 under ether all the ulcerated areas were cleaned up shaved down to an apparently normal base and Thiersch grafted fourteen different grafts being applied Contrary to all expectations the great majority of these grafts adhered and *have never broken down since* nor do they show the eczematous condition which now exists on the areas not grafted Pain ceased absolutely from the time of operation and areas then grafted are in good condition to day Epithelioma has *never* developed in any graft which *completely* took at this time (I quote from a letter which the patient wrote me in 1905)

Though all X-ray work was stopped for a year ulcers developed upon the fingers, and again in spite of all treatment refused to heal until excision with skin-grafting was carried out, after several operations all the chronic lesions were successfully grafted or healed spontaneously, except some very persistent ulcers on the ends of the ring fingers of both hands and the little finger of the right hand, which in spite of six or seven operations refused to heal

In July, 1902, the persistent ulcerations at the tip of the ring fingers were again excised and grafted. The grafts did not take. The specimens sent to the pathologist were misplaced and not until October, 1902, was the report received that both ulcerations showed unmistakable evidence of carcinoma. In the meantime these finger tips had become excessively sensitive and painful and showed an angry-looking ulcer, with somewhat raised and indurated edges. On or near October 31, 1902, both of the ring fingers were amputated at the knuckles

- I The ulcer on a ring finger is shown in Fig 1
- II The gross appearance under a low power in Fig 2
- III The microscopic picture in Fig 3

During the period from October, 1902, until June, 1905, a dozen or more operations under ether were performed—amputation of the middle finger of the left hand, removal of the tips of the second and third fingers of the right hand, and numerous excisions of keratotic areas or chronic ulcerations on the dorsum of the remaining fingers or backs of the hands. Figs 4 and 5 show the conditions of the hands

In June, 1905, for the first time in eight years, the patient was free from pain and no dressings had to be worn. Both hands could be placed in his trouser pockets. The left hand was soundly healed, the right showed one superficial ulceration at the base of the third finger, with considerable thickening of the skin about it and numerous other keratotic areas. Unfortunately during the summer the favorable condition did not endure, but steadily, though slowly, several places on both hands began to break down. Under date of November 8, 1905, the following notes were made: "For three months following a slight bruise and subsequent infection, there has been a great deal of pain in the tip of the stump of the little finger on the right hand, gradually an ulcer formed,

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FIG 3



Ring finger 1902 High power



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FIG 5



Condition of hand June, 1905

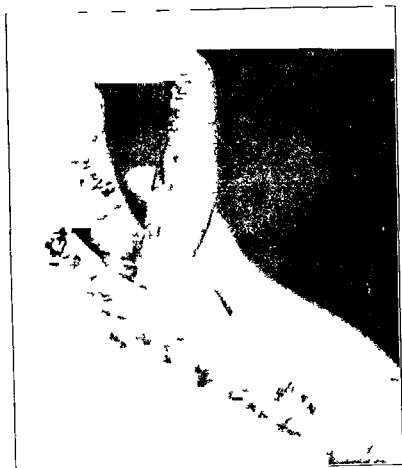


FIG 7



Keratosis on back of hand Carcinoma at base of middle finger Nov , 1905

about the size of an old fashioned three cent piece which looks very angry and resembles those found in the ends of the fingers in 1902

Figs 6 and 7 show the condition At operation the end of the little finger was removed and a suspicious ulceration at the base of the third finger thoroughly excised The back of the forefinger over the second phalanx showed a superficial unhealthy looking ulceration which involved the old graft on the ulnar side of this finger were several macerated warts which had been excessively sensitive and painful On the radial side were numerous cracks and fissures with some keratoses but nothing suggesting anything malignant All these lesions were excised as were seven other places on the backs of the hands and Thiersch grafts were applied All of these grafts took except those on the back of the forefinger which sloughed and left exposed the white and glistening but not necrotic aponeurosis of the extensor tendon Dr Wright's examinations showed that the ulcer on the end of the little finger was not malignant but that the specimen removed from the base of the third finger was a typical epithelioma One or two others suggested beginning cancerous degeneration

During the winter and spring of 1906 these areas broke down further and the middle joint of the first finger from sloughing of the extensor tendon became flexed and discharged synovial fluid For a time there was some infection but this soon passed away During the summer the patient suffered much from this persistent ulceration The back of the middle finger also began to break down

In November 1906 under ether the ulceration and unhealthy granulations on the back of the first finger were again excised Examination by Dr Wright of frozen sections showed epithelioma or at all events invading epithelium accordingly the excision was extended into apparently sound tissue at the margins and the base was removed down to the bone The dorsum of the third finger was thoroughly scraped with the knife the tip of the little finger of the left hand removed for persistent ulceration and several suspicious areas excised All open surfaces were grafted successfully except the backs of the second and third fingers A subsequent report from Dr Wright confirmed his diagnosis of superficial epithelioma in the tissues

removed from the back of the forefinger, the ulceration on the third finger was negative

By January 1, 1907, there was some evidence of healing from the edges in both ulcerations. The patient wished very much to delay radical treatment of the first finger, for as the third finger was stiff, amputation meant almost total disability of the right hand


The condition of the hands on April 25, 1907, is shown in Figs 8 and 9—*the result of ten years of treatment and twenty-five operations under ether*

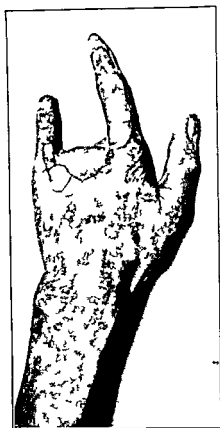
On the left hand the thumb is sound and serviceable. The forefinger is stiff, but shows no lesions. The third and fourth fingers have been amputated. The little finger lacks a terminal phalanx. On the back of the hand there are a few keratoses, but no ulcerations. *On the right hand* the thumb is useful, but at its base is a small ulceration, and the whole ulnar side is covered with thickened epithelium. The forefinger is flexed and presents an ulceration over its middle which is undoubtedly malignant (This finger will be amputated in June). The middle finger is stiff. There are a few sluggish granulating areas on the dorsum, but these are healing in. The fourth finger is lacking, as is also the end of the fifth. There are numerous keratoses, but no other ulcerations on the back of the hand

The palmar surface of both hands is normal. The skin grafts, which are outlined in black, are soft, movable, and some of the thicker ones have almost the appearance of normal skin

The axillary glands have been somewhat enlarged for many years, but show no evidence of increase in size

From the first demonstration of epithelial cancer in 1902 on the tips of the fourth fingers, undoubted malignant degeneration has been found in eight other areas, so that we have the extraordinary development of ten different epitheliomas in one case in five years. As the report by Dr. White will show, from such a condition there are all grades of what might be termed precancerous changes, down to simple ulceration or benign keratosis. In this as in the other reported cases, persistent ulceration has for a time, from three to six months, always preceded cancer





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FIG 9



Condition of hand, April 1907

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H d f C M 5 90

FIG 11



Hand of G , April 1907

In addition I will report a second case of chronic but much less severe dermatitis to show the advantage of skin grafting for recurring fissures and the report of Dr Mallory upon the recurrent growth which may prove to be a sarcoma

Mr J G X ray operator has suffered for many years with the milder varieties of X ray lesions such as atrophy of the sweat glands more or less persistent eczema marked atrophy and longitudinal ribbing of the finger nails with the characteristic X ray telangiectases and keratoses During the winter most painful fissures occurred over the extensor surfaces of the joints It is of interest to note that none of these lesions are present over the proximal phalanx of the ring finger which was protected from all early exposures by a broad gold ring

In May 1906 the keratoses and fissures on the back of the right hand were excised and grafted Fig 10 shows condition ten days after the operation All of the grafts took These were prominent and raised above the surface for a month but at the end of that time were level with the surrounding skin and remained solid until September 15 when a spot on the terminal phalanx of the ring finger became ulcerated Under gas and ether on October 18 this ulceration was freely excised and the radial fourth of the nail with its matrix extirpated The skin at the margin of the nail was approximated with plaster and another graft was applied In ten days the wound was completely healed and free from pain This finger remained painless and healed until the middle of March 1907 when the distal part of the graft on the radial side began to increase in size and show well marked vascularity After two weeks there was a slight discharge near the edge of the nail

Examination by Dr Wright of this specimen led him to make a diagnosis of spindle celled sarcoma though by some the growth was thought to be a granuloma

By April 23 1907 the growth had become decidedly larger and was apparently extending backward into the proximal graft See figure 11 After careful consideration of the possibility of the return of the growth excised in October but chiefly influenced by the anatomical conditions which could not in all probability be rectified by removal of the nail and grafting the

terminal joint was amputated under gas and ether. The wound was completely healed in a week.

Examination of tissue from finger of J. G. following exposure to X-rays by Prof. Mallory, of Harvard Medical School.

The section shows an oval, cellular mass of tissue partially surrounded by more or less normal fibrous tissue. The cellular mass at its outer end is ulcerated and covered with fibrin, cells and dried necrotic tissue. The more normal tissue is covered with epidermis. The oval, cellular mass of tissue is quite sharply defined and is limited by a layer of dense, fibrous tissue. It is composed of rapidly growing connective tissue cells and of a small number of thin-walled blood vessels. The connective tissue cells are typical, that is, they have flat, oval nuclei and contain one to three coarse chromatin masses. The cytoplasm is made out with difficulty. In places the cells are bordered by very delicate fibroglia fibrils. Everywhere the cells are separated from each other by a relatively large amount of ordinary (collagenous) fibrils. The cells and their fibrils tend to form small bundles which run in all directions. Mitotic figures are numerous, one to three showing in nearly every oil immersion field. While the cellular mass of tissue at its base is sharply defined, on both sides, it gradually blends with the adjoining connective tissue.

The adjoining tissue of the finger shows infiltration with numerous groups of lymphocytes. Otherwise there appears to be no change in it. It is difficult to give a positive diagnosis in this case. The rapidly growing mass of connective tissue may be either an unusual form of reparative action on the part of connective tissue or it may be a connective tissue new growth, namely, a rather slow growing spindle-cell sarcoma. Personally I favor the former view owing to the lack of any definite evidence as yet of invasion.

F. B. MALLORY

The microscopical appearances under the low and high power are shown in Figs. 12 and 13. Note beginning epithelial infiltration at the extreme right of the photograph.

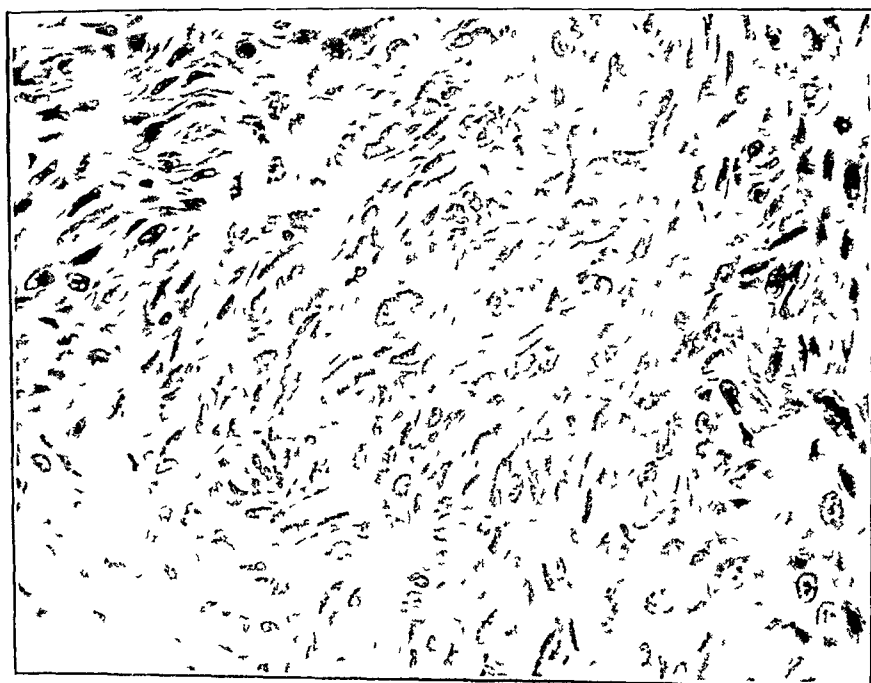
During my long experience with the first case I have learned many things about skin grafting, and now have no hesitation in recommending it, as the best treatment for all chronic X-ray lesions. Early in the history of this case, the tissues were remarkably vascular. There frequently occurred little hemorrhages in the skin, which were often the starting-point of subsequent ulceration, there appeared to be an almost complete vaso-motor paralysis. Owing to the chronic eczema no adequate disinfection was possible so that most of the early

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FIG 13



Same as Fig 12 High power

operations were somewhat influenced by sepsis yet in spite of this the grafts often took surprisingly well. Hæmorrhage proved to be most troublesome not only at the time of operation but subsequently when blebs would form under the grafts and unless speedily snipped with scissors would detach them. Hæmorrhagic infiltration of the grafts was often noticed on the second or third day doubling their thickness.

As a rule I applied a finger tourniquet before excising as much of the work had to be done with great care especially when dealing with a suspicious ulceration over an aponeurosis or tendon sheath. Fortunately no deep infiltrations have yet occurred. After excision firm pressure by gauze was applied to the raw surfaces for ten minutes and the hands were then exposed to the air and held aloft. No grafts should be applied until all bleeding has ceased. So far as possible an attempt should be made to bevel the edges of the wound. After shaving off granulations to get a smooth surface the base of the wound is next examined for vascularity in order to determine the thickness of the graft which should be used. While the ultimate result if successful which a thick graft gives is most desirable I feel sure that I have occasionally jeopardized healing by attempting to place a thick graft upon a very small spot or upon such bloodless tissues as the backs of the fingers. I now use thinner grafts. If these fail another operation should be done when the surface has become covered with granulations. A very small spot upon the fingers is most difficult to graft. I have had the best results by cutting a special graft for each place thickest in the middle and gradually thinning towards the periphery in order that it may fit evenly into the concavity of the wound. When possible the whole forearm was firmly fixed with adhesive plaster to a well padded palmar splint before any of the grafts were applied. More than once from a sudden movement of the patient or an assistant many of the grafts have been brushed off. The patient should be kept under full surgical anesthesia until the dressing is completed.

After having tried all the methods of dressing the

grafts with which I am familiar, I have adopted the following technique, and after-treatment. The grafts are so cut and arranged that they *do not overlap* either the edges of the wound or each other. If on the back of the hand, they are covered with a piece of rubber protective tissue which extends not more than $\frac{1}{8}$ of an inch beyond their edge, if on the fingers, narrow strips of protective, arranged in an imbricated fashion, encircle $\frac{2}{3}$ of the finger, and are stuck in position with blood, which soon coagulates. A small absorbent gauze pad is then placed over the protective and then *direct downward* pressure is applied by a piece of gauze or bandage, which is tied with a surgeon's knot on the palmar side of the splint. I was forced to resort to this manœuvre by the discovery that the smaller grafts now and then were carried from left to right by the ordinary application of the bandage. Owing to the amount of exudation which occurs immediately after the operation, I have found it unwise to adopt immediate exposure to the air, as is now customary in *normal* skin-grafting. After twenty-four hours, with the hand continuously elevated, the protective is carefully removed. Longer delay in this case has almost always been followed by maceration of the grafts.

At the first dressing, blebs, if present, are snipped with the scissors and their contents gently expressed. Any lateral movement of the graft must be avoided. All the *edges* of the individual grafts are then greased with lanolin, or with the following ointment which was found to be less macerating:

Benzoinated lard	175
Lanolin	25
Ichthyol	4
Silver citrate	1

The grafts were then covered with a cage and allowed to dry, exposed to the air, and so treated for the next week whenever possible. Often, however, the sensitiveness and pain after half an hour's exposure were so great that the whole surface had to be covered with the ointment.

Almost without exception the pain in these ulcerated areas as well as in the X ray burns which I have excised has ceased from the time of operation. It is interesting to note that in one instance thick grafts grew even on the base of an epitheliomatous ulcer but within three weeks became excessively hypertrophic. After subsequent amputation of the finger sections showed carcinoma invading the bottom of the œdematous graft.

Though future events may prove that my treatment of this patient has been too conservative his present condition would seem to justify it.

In order that the abundance of material which has resulted from all these operations may prove of value to dermatologists interested in the study of the pathological conditions induced by the X rays Dr C J White has kindly made a careful examination of all the slides which have been preserved and his exhaustive report forms a most valuable addition to my paper.

The clinical appearances of the chronic X ray dermatoses suggest a precocious and extreme senility of the skin microscopic examination also shows the most extraordinary changes always of a degenerative character unequalled in their severity and chronicity by the effects of any other agent.

In view of these facts and the histories of the eleven cases reported I think the following conclusions are justified.

- 1 For the atrophic condition of the skin and the telangiectases nothing can be done.
- 2 Hypertrophic changes keratoses and warts may with safety be treated in the usual manner. If such treatment fails excision with or without skin grafting will probably relieve the pain and result in a cure.
- 3 Excision and grafting will prove to be the best treatment for recurrent fissures.
- 4 All ulcerations which under ordinary treatment remain open after three months should be thoroughly excised and very carefully examined. The subsequent treatment de-

pending upon the result of the microscopic examination, should be skin grafting, further excision and grafting, or amputation

5 As the history of almost all of these cases of severe and chronic dermatitis dates back to early exposures, with the protection which our present knowledge demands, it is to be hoped that the number of victims of too enthusiastic work in an untried field, will steadily diminish

6 In the meantime, I have no hesitation in recommending the *early excision* of all *persistent X-ray ulcerations*, in order that subsequent malignant degeneration may be prevented

PATHOLOGICAL REPORT

BY CHARLES J WHITE, M D,

Instructor in Dermatology in Harvard University

The pathological report which follows is based upon the study of forty-three microscopic slides presented by Dr Porter The sections were already stained, for the most part by the hæmatoxylin-eosin, iron-hæmatoxylin and methylin blue-eosin methods It is to be regretted that no fresh material was at hand for the special staining of connective tissue and elastic fibrils The first sections date from July 17, 1902, and were as follows

1 *Finger of Right Hand*—Keratosi moderate Rete somewhat hypertrophic and shows an increased tendency toward downward proliferation Corium normal and presents no marked signs of inflammation The deeper horizontal vessels, however, exhibit serious changes In places veins appear displaying extraordinary mural thickening No interior alterations are present beyond a slight enlargement of the cells but the outer coats are greatly hypertrophied Here and there arteries are totally obliterated by endothelial overgrowth

2 *An Ulcerated Area*—The rete, where existent, is totally abnormal The stratum corneum consists of a few lamellæ of non nucleated cells The stratum granulosum is absent The stratum spinosum is made up of greatly dilated cells, the extra-nuclear protoplasm being much rarified and the nuclei shrunken, murally placed, or entirely gone The palisade layer, however, shows comparatively normal elements Here and there are masses of red blood cells, suggesting golden pigment granules and filling the whole depth of the rete

As the ulcer is approached the spinous cells show more distinct

configuration but are horizontally elongated and interspersed with erythrocytes.

Corium—Below this abnormal epidermis there are occasional masses of plasma cells accompanied by a rare mast cell. The papillary and sub papillary vessels are dilated and many are clogged with red cells. Larger deeper vessels are choked with endarterial masses of nucleated cells. This condition is extraordinarily abundant—the lumen of some vessels of great size being entirely obliterated.

Invasion of the entire corium are polymorphous masses of epithelial cells ranging from small strings to great clumps with many smaller epithelial pearls. The epitheliomatous masses are outlined by a limiting band of deeply staining cells. Within these peripheral bands the cells are often oval and greatly enlarged with correspondingly hypertrophic nuclei containing one or two nucleoli. Some of the cells are really enormous (fusion?) while around them appear epithelial cells whose limiting membranes are indistinct and whose nuclei have disappeared. The epithelial pearls are large some of them consisting of a nucleated centre surrounded by 15 to 20 concentric hyaline rings.

Mitoses are rare and between these epithelial masses are numerous cells.

3 *From a Finger*—For the most part the epidermis is normal although the rete is somewhat hyperplastic. In one place per contra the spinous layer has receded to three or four layers of somewhat amorphous cells ill defined from the underlying corium and exhibiting deeper proliferation suggestive of epithelioma while above a nucleated crust appears.

The corium shows in the middle and lower layers a few highly dilated lymph spaces and some moderately enlarged blood vessels surrounded by dense plasmomata with an occasional mast cell while still deeper are seen blood vessels presenting an obliterating endothelial change and again others with persistent but distorted lumen and thickened walls surrounded by dense envelopes of connective tissue.

4 *From a Finger*—Within the lobules of epithelioma are many large oval and round swollen pal staining cells—some of great size. The progressive steps towards the formation of pearls can be demonstrated easily. Again mitoses are rare.

5 *Finger of Left Hand* (see photograph 3)—*Rete*—Where the epidermis is intact there is a marked parakeratosis and acanthosis. The horny layer is decidedly thickened and nuclei persist. The stratum granulosum is absent. The upper layers of spinous cells are flattened and elongated and more or less devoid of nuclei and the whole rete somewhat hyperplastic. In several places the epidermic origin of the epithelioma is plainly manifest and broad masses of tumor cells are seen in direct continuation with the overlying epidermis.

Throughout the depth of the corium are seen lobules and whorls of epitheliomatous cells between which the collagenous bundles form a delicate meshwork in which are lodged masses of mononuclear cells—for the most part plasma cells—and very numerous small dilated vessels. Before any degenerative alterations have developed the cells of the outer

layers of the lobules retain their prickles undiminished With the onset of degeneration, however, we note a disappearance of these spongioplastic prolongations and a concentric arrangement of the cells Within these onion-like lamellæ the cells assume a roundish configuration with occasional great perinuclear halos while in the centre of the mass appears a basic-staining substance reminiscent of keratin These conditions well illustrate the epidermic derivation of the tumor masses by their analogy to the progressive cornification of the normal epidermis

In other parts of the section the epidermis shows less keratosis while the rete produces long finger like projections into the corium Finally, in still other areas, there is ulceration The lowermost layers of the rete alone persist as round or oval, swollen cells, while again all signs of the epidermis are wanting and the surface is formed by a highly cellular corium

The vessels are everywhere dilated The papillary and subpapillary channels are delicately widened and the interlobular passages show the same condition while in the non-epitheliomatous parts of the section the deep vessels are very conspicuous and here and there form great reservoirs like those seen in cavernous angiomata These veins do not exhibit dilatation simply, for their walls are manifestly hypertrophic

Curiously enough, pigmentation, which we associate so strongly clinically with X ray dermatoses, seems to play no rôle throughout all these sections and hæmatin or melanin granules are conspicuously absent

6 Ulcer Tip of Third Finger of Right Hand—This area presents a central ulceration with comparatively normal epidermis on each side The floor of the ulcer is composed of string-like serpentine masses of epithelioid cells, groups of erythrocytes, polynuclear leucocytes and rather inconspicuous bundles of collagen Lower down the field becomes less troubled The pus cells and red corpuscles disappear The epithelioid masses grow less numerous while mononuclear elements and connective tissue cells replace them The epithelioid elements for the most part form worm like processes, but in places this configuration is lost, branches develop or irregular masses are produced These figures are composed of cells exhibiting large, oval or round nuclei which contain many nucleoli and are surrounded by meagre protoplasm with no retaining envelop Here and there are especially large cells which seem to be pushing their way through lymph spaces

7 From a Finger—Here the epitheliomatous process is young The epidermis shows a loss of the stratum corneum The granular layer is practically wanting save for an occasional attenuated cell with but few granules The upper layers of the rete are elongated and more or less devoid of nuclei The germinal cells on the other hand are conspicuously numerous, absorb the stains deeply but show an irregular demarcation from the subjacent corium and exhibit occasional downward buds

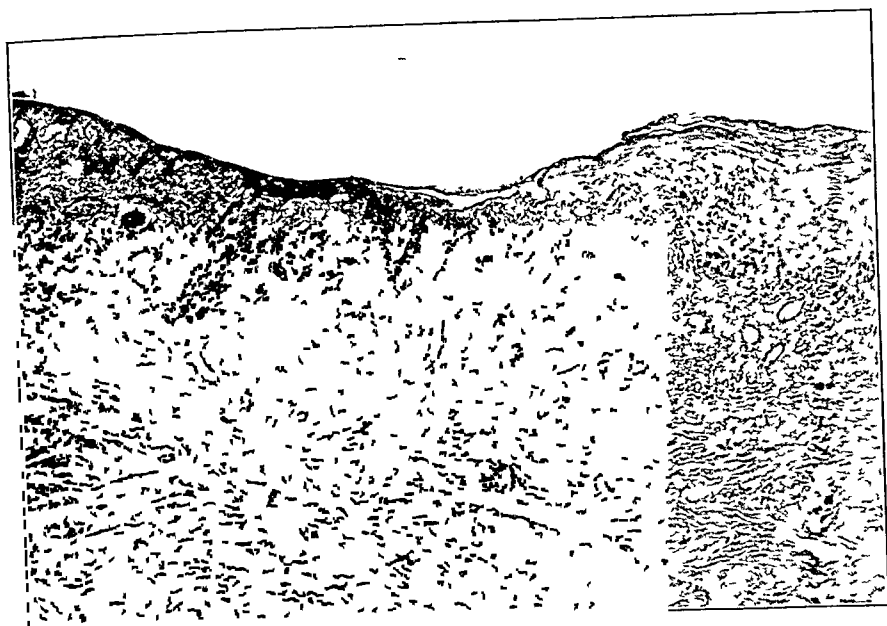
The corium presents dilated subpapillary vessels with hypertrophied endothelial cells while the deep veins are enormously enlarged with frequent great thickening of their several coats In the sub-papillary layer there are striking masses of plasma cells with infrequent mast cells

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FIG 15



Section from base of ulcer on back of right wrist, December, 1903

especially about the vessels. Here again can be seen delicate string like masses of epithelioid cells which wind through the lymph spaces. Where these masses widen out their component cells display large swollen nuclei. Evidences of chromatophores or of free pigment granules are once more wanting.

Where epitheliomatous changes are absent the connective tissue nuclei are appreciably elongated and enlarged.

Thus far these sections date from the operations of July 17, 1902.

Back of right wrist December 23, 1903 (Fig. 14). The epidermic structures are normal with the exception of a slight tendency toward irregularity where the palisade layer and corium meet and here certain nuclei are surrounded by clear spaces while others have dropped out and are replaced by inflammatory cells.

The papillary vessels are dilated with hypertrophied endothelium. The corium is very dense and is filled with mononuclear cells not particularly grouped but generally distributed.

At the periphery of the section however where the section ends abruptly through ulceration (?) there are two lobules of epithelial cells. One suggests the epidermis irregularly cut (cross section?) the other contains oedematous cells some without nuclei others swollen with large vesicular nuclei others containing granules of keratohyalin—in fact the whole picture is strongly reminiscent of the epidermic changes seen in molluscum contagiosum. The whole structure is surrounded by inflammatory tissue.

8 Back of Right Wrist (December 23, 1903 Fig. 15).—To one side of the ulcerated area shown in the photograph the epidermis is greatly modified. The palisade layer forms a straight but broken line owing to the disappearance of the papillæ. The cell nuclei are round or oval rather than elongated show one or more sharply staining nuclei and are filled with chromatin granules. The intercellular spaces are irregular and often enlarged. The overlying layers of the rete are thickened and present swollen oedematous loosely opposed cells mostly free of nuclei and spines. The granular layer is represented by free keratohyalin granules only all other evidences of granular cells having disappeared. Lastly the stratum corneum is composed of many dense lamellæ with numerous persistent nuclei. Thus the whole epidermis presents acanthosis and parakeratosis of pur type.

In the corium the absence of papillæ has already been alluded to while the subpapillary vessels are widely dilated and exhibit hypertrophic endothelial cells. Below the collagen is comparatively normal save for occasional swollen bundles. Moderately numerous plasma cells and rare mast cells are present sometimes grouped about a distended vessel. Finally deep down in the corium appear prominent veins now endothelially now totally thickened.

The ulcerated portion (Fig. 15) presents a complex picture of masses of polynuclear leucocytes and red cells lying in a medially coarse reticular union with interspersed large dilated vessels filled with erythrocytes and coagulated fibrin and with occasional processes of epithelial cells with

grossly vesicular nuclei growing in from the sides or persisting as remnants. Below these abnormal elements lies a floor of thickened, rather anuclear collagenous bundles.

9 *Base of First Finger of Right Hand* (December 23, 1903, Fig 16)—This represents scar tissue of considerable thinness. The epidermis consists for the most part of parallel bands of dense nucleated corneous lamellæ with occasional layers of rather amorphous, homogeneous, quasi rete cells containing infrequent round or oval nuclei surrounded by empty spaces. The germinal layer is represented by horizontally lying cells with flattened nuclei.

Even here the epidermis shows an effort toward downward proliferation foretelling future epitheliomatous growth.

The corium shows an absence of papillæ. The subpapillary layer is not as compact as one would suppose and its meshes are strewn with plasma cells, as seen in the photograph (16). There are frequent epitheliomatous cell nests, some solid and normal, others presenting varying degrees of central degeneration. In one (lying nearly centrally in the illustration) there is an outer ring of fair sized, numerous, darkly-staining nuclei separated by a clear zone (artefact?) from the inner lamellated, flatly-nucleated layers which in their turn envelop an almost homogeneously degenerated centre containing an occasional giant nucleus and scattered nuclear debris and two large cysts partly filled with granulated protoplasm and mononuclear leucocytes.

The base is composed of practically normal fibrous tissue and the deep vessels when present exhibit no marked changes.

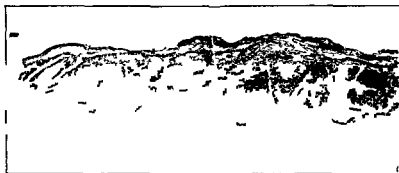
10 *Middle Finger of Left Hand* (December 23, 1903)—The tissue here is composed of a dense mass of fibrous elements devoid of all epithelial structures and free from vessels. It consists of practically structureless collagen on which lie small, round, solid-staining nuclei, the exact nature of which it is difficult to discern. In the deeper portion of the section the fibrous bundles form a reticulated mesh devoid of nuclei. The whole picture presents an extraordinarily blank mass.

11 *Base of Third Finger of Right Hand* (December 23, 1903, Fig 17)—The photomicrograph, 17, illustrates well the conditions present.

To one side an ulcerated surface of thickened collagenous material supporting numerous, many sized, mononucleated cells and small and large interstices containing erythrocytes with occasional whorls of œdematous and degenerated epithelial cells.

Where the epidermic covering is present the various layers are much altered. The rete shows an irregular base with marked tendency toward downward proliferation. The upper strata are emphatically hypertrophied while their component cells have lost their prickles and tend to coalesce, so that cell boundaries are gone, nuclei are swollen or absent and protoplasm is cloudy. The granular layer is represented for the most part by free kerato-hyalin granules. The stratum corneum is hyperplastic and nucleated. Again a marked picture of acanthosis and parakeratosis. Pigment is conspicuous by its absence.

The corium exhibits only occasional papillæ which are filled with



S t f m t b f first f g f gh h d D mbe 903



S t f m t t b f thid f g frighth d

highly dilated vessels. The skeleton of the skin is composed of dense rather anuclear bundles. Deeper vessels when present show considerable thickening of their walls and constriction of their lumen and are surrounded by plasma and other mononuclear cells.

12. *Base of Little Finger of Left Hand* (December 23 1903).—The process represented here is one of hyperkeratosis. The corium is dense. Vessels are slightly dilated and encompassed by extravasated mononucleated cells. Papillæ are insignificant. The rete is somewhat thickened for this part of the body but otherwise normal. The granular layer is manifestly hyperplastic and consists of five to six rows of large swollen cells with somewhat blunted ends and filled with masses of kerato hyalin granules. The stratum lucidum is suggested but shows no traces of elevation. The stratum corneum is conspicuously thickened and composed of layer upon layer of waving horny cells.

13. *Tip of Middle Finger* (September 19 1904).—A very complex and irregular picture. The epidermis is mostly gone the few surviving vestiges being quite atypical. The corium is totally abnormal and it is difficult to orientate oneself.

The upper layers are filled with dense masses of plasma cells and with sparsely scattered lymphocytes. Small dilated vessels with extraordinarily vesicular nuclei abound choked with red cells and occasional lymphocytes. The supporting fibrous tissue is in places dense in others delicately reticulated the intensity of the plasmomata corresponding directly with the density of the collagen. Here and there are small lobules of epithelial cells occasionally whorls and more rarely branching tubules. All three forms exhibit absence of prickles and presence of highly vesicular cells containing one or two nucleoli and dense chromatin granules. The whorls and the tubules show a tendency toward central hyalin degeneration. When visible though comparatively freed from inflammatory invasions the fibrous tissue shows a moderate proliferation of its nuclei.

14. *Base of Middle Finger* (September 19 1904).—Great hyperplasia of the rete is the distinguishing feature here. For the most part the changes are purely one of overgrowth in the depth of the layer. The cells are normal although somewhat oedematous and there is marked intercellular invasion of leucocytes. Here and there however the cellular elements show loss of prickles vacuolation and tendency towards homogeneity. The stratum granulosum is represented mostly by free lying kerato hyalin granules with occasional areas of partly developed granular cells. The horny layer is compact but otherwise normal.

The dividing line between epidermis and corium is so indefinite owing to the great overgrowth of the rete and the irregularity of the cut that it is difficult to ascertain the presence or absence of papillæ. There are numerous foci of snared off epithelial clusters. The corium is dense and interspersed with numerous plasma cells especially in the subpapillary layer.

15. *Keratosis from Dorsal Base of Middle Finger of Right Hand*.—This region presents an epidermic picture somewhat similar to the last

but here one finds the additional presence of a hyperplastic horny layer containing some nuclear cells. Again, the demarcation between corium and epidermis is well marked and the palisade layer more normal. Papillæ are present and hold dilated vessels—in one instance the whole papillary space is occupied by a vessel whose wide lumen is partially filled with lymphocytes, polynuclear leucocytes, erythrocytes and granular or reticulated fibrin. The corium presents the condition so frequently described in these sections, *i.e.*, dense collagen with dilated vessels and extravasated mononuclear cells.

16 *Tip of Little Finger* (September 19, 1904)—Another picture of parakeratosis and acanthosis with absence of papillæ and dense infiltrated corium.

17 *Ulcer on Back of Left Hand* (October 16, 1904)—A complicated structure. The epidermis is entirely gone and the corium contains many polymorphous epithelial lobules and whorls, superficial dilated vessels blocked with red and with white cells, and innumerable endothelial and mono- and polynuclear elements. The epithelial whorls and lobules consist in the majority of instances of spine bearing cells and present all stages of degeneration even to cystic spaces containing chromatin granules and reticulated or granular protoplasmatic debris.

The underlying corium is composed of dense fibres with elongated and enlarged nuclei and the deeper vessels are murally thickened.

18 *Keratosis of Right Wrist* (October 16, 1904)—Once more conditions now so familiar in this series of sections. Here one finds a hyperplastic rete whose upper layers are œdematous and degenerated, a total absence of granular cells and even independent granules, and an enormously overgrown horny layer bearing nucleated scales and leucocytic crusts.

Papillæ are insignificant. Subpapillary vessels slightly dilated. Collagen delicate in structure and supporting some mononuclear extravasated cells.

Sections from five other excised portions of this same date show pictures presenting the various characteristics which have marked those previously described and need not be detailed again.

19 *Graft Upon Middle Finger of Left Hand* (October 16, 1904)—The artificial epidermic covering is to all intents and purposes normal, but in one portion of the section the insidious process has redeveloped and below the rete one finds the now familiar epithelial lobules with central hyaline degeneration.

20 *Keratosis from Forehead* (December 27, 1904)—A newly invaded field. This section illustrates almost perfectly the epidermic characteristics of the sole of the normal foot. The rete is somewhat thickened, the cells of the upper transitional layers more or less vesicular and thrown up into jagged summits and depressions into which dovetail layer upon layer of normal horny cells. The corium, however, shows evidences of considerable inflammation. Vessels are dilated and plasmomata are frequent. Sweat and sebaceous glands hitherto not observed in these sections are present in great abundance and exhibit no marked deviation from the normal.

21 *Forehead* (April 20 1905).—The intervening five months have wrought a great change. In the present section ulceration has occurred and at the epithelial edge the cells of the upper layers of the rete are flattened and contain perinuclear halos or empty nuclear spaces all semblance of granular cells has vanished and a thin, parakeratotic horny layer is present. The lower layers of the rete are running riot. They have overcome the normal resistance of the corium and are proliferating enormously into the subjacent structures. Individual cells are often of enormous size and have become amorphous anuclear swollen masses of protoplasm. In other areas large vesicular nuclei are present with but scant surrounding protoplasm. Cellular invasion is absent.

Farther down in the corium hugely swollen anuclear bundles of collagen and some veins of extraordinary thickness and jagged slit like lumen appear. These unusual collagenous fibres would suggest an incipient colloid degeneration. The sweat glands remain strangely unaffected in the midst of these contiguous pathological structures.

22 *Hand* (November 8 1905).—These sections are cut largely in so horizontal a plane that it would be injudicious to judge of the epithelial changes. There is nevertheless marked hyperplasia of the rete with occasional loss of nuclei especially in the germinate one general cloudiness of the cells and some intercellular leucocytic invasion. In places all vestiges of normal metamorphosis from rete to horn cells have gone and the free surface of the skin forms a chaotic mass.

The subpapillary layers which alone are present show fine reticulation supporting normal vessels and a general plasmatic infiltration.

23 *Keratosis from the Hand* (November 8 1905).—Here one has an ideal representation of a papillary and verrucous naevus. The rete is cast in individual rounded lobes formed by the fine and widely separated ascending papillae and in places these lobes strongly suggest the lower rete conformation of *milium cystosum*. In these lobes the rete is hyperplastic and fairly normal although perinuclear halos are common. The granular cells also exist in great numbers and one can count ten to twelve perfectly developed layers while above before keratinization has been completed as many more layers half granular half keratinous appear. Above these increased strata lie rows upon rows of typical horn cells. Thus far the description has related to the interpapillary lobes but as is the rule in naevous pictures the rete and granular layers surrounding the papillae do not present these hyperplasias but appear in comparatively normal amounts.

The papillae are proportionately narrow but project far into the epidermis in some instances to extraordinary distances. As is customary in this class of naevi the papillary and subpapillary vessels are slightly dilated and accompanied by a moderate number of mononucleated cells which lie between and under the epidermic lobes. The rete is practically normal.

24 *Ulnar Side of Forefinger* (November 8 1905).—A mild degree of the preceding process partly purely keratotic and partly slightly papillomatous.

25 *Ulceration of Finger* (November 8, 1905)—An intensely interesting picture of multiform and generalized degeneration which has affected practically all the various structures of the skin

The epidermis is represented by remnants of previous downshoots from the rete which persist as barely recognizable, swollen, amorphous, acid staining protoplasm with occasional vesicular nuclei

The papillæ of the corium are gone and the subpapillary layer holds numerous moderately dilated vessels within frequent, cloudy vesicular endothelial cells and with swollen lymphocytes, a few pus cells and reticulated fibrin in their channels Collagen appears as straight, oedematous bundles between which extend chains of oblong plasma cells and more irregularly distributed lymphocytes These plasma cells are histologically noteworthy for one seldom sees such well defined examples with their eccentrically placed, round nuclei bearing symmetrically arranged peripheral nucleoli

These rows of alternating plasma cells and swollen collagen are interrupted by frequent vessels whose walls are cloudy and whose nuclei are vesicular and often of great size Below, there are isolated or grouped masses of wavy or serpentine basic-staining elastic fibres (elacin) which lie between the fibrous bundles or form large, solid areas free from collagen

26 *Outer Side of Forefinger* (November 8, 1905)—Another ulcerated surface disclosing many of the attributes of the previous section but not containing so many interesting histological features

27 *Back of Right Hand* (March 16, 1906)—In this section there are stretches of epidermis and of ulceration Where the former is present there is some tendency toward hyperplasia of the rete while the stratum granulosum is absent and the stratum corneum is represented by a thin homogeneous mass Underneath, the corium is normal except for universally dilated vessels surrounded by plasmomata

Where the epidermis is gone the corium is filled with circular or polymorphous lobules of epithelial cells which show no tendency toward degeneration Multiple dilated vessels with lumens choked with red cells lie between these epitheliomatous masses and scattered universally throughout the depth of the derma are many mono- or polynucleated inflammatory cells

28 *First Finger of Left Hand* (March 16, 1906)—A pathological condition similar to the last but here the epidermis is intact, exhibiting hyperplasia of the rete and of the horny layer, both of which are infiltrated with many leucocytes usually of the pustular type Here also evidences of downward proliferation of the rete are visible Finally there is abundant hæmorrhage everywhere

29 *Tip of Third Finger* (March 16, 1906)—This piece of skin is free from epitheliomatous changes For long stretches the upper layers of the epidermis are wanting while the corium exhibits in all parts many dilated vessels and multitudinous plasma cells

30 *Excision* (November 4, 1906)—This section, the last in this long series, exhibits undiminished evidences of epithelioma

The horny layer is practically non-existent the granular layer is normal. The rete is in places thickened and displays numerous infiltrating leucocytes and at its germinate layer evinces signs of downward penetrating proclivities. Papillæ are present and bear slightly dilated vessels. The subpapillary layer is delicately reticulated and holds frequent plasmomata and distended vessels containing fibrous meshes and occasional polynuclear leucocytes. Just below this level lies another series of plasma cell masses whose characteristics are strikingly visible and immediately subjacent are extensive areas of epithelial whorls and lobules surrounded by still further plasma cells.

The outer lamellations of these whorls show well-differentiated peripheral ring cells but within lie degenerated puffed cells free from prickles and at times from cell boundaries containing frequently giant nuclei or no nuclei at all and more mitotic figures than in the previous pathological history of the case. Finally in the very centre of some of the whorls are found large cysts partially filled with coagulated fibrin giant nuclei and abundant chromatic remains. Where these cysts appear the epithelial masses are more pearly than elsewhere.

This then is the detailed description of the pathological side of this discouraging history and it is distressing to find at the end of this long series a slide exhibiting the most active phases of the disease.

One who has read the histological minutiae of the case will be struck presumably by the manifold varieties of the pathological structures. Almost every known phase of epidermic deviation has been encountered and the cellular vascular and protoplasmic alterations and degenerations have been most varied and interesting. The one striking omission in the case has been the unexpected absence of all pigmentary signs especially when one remembers how prominent a clinical feature pigmentation is in X-ray dermatitis and its epitheliomatous sequelæ.

PHAGEDENIC ULCERATION OF BOTH BREASTS DURING THE PUERPERIUM

BY JOHN DE VINNE SINGLEY, M D,

OF PITTSBURG, PA,
Surgeon to the Pittsburg Hospital

THE following case is reported on account of the rarity of phagedenic ulceration other than the venereal type, and as an example of the rapidity with which such a process extends, well known in pre-antiseptic days, rarely seen now

Mrs J, aged 20, admitted to the Pittsburg Hospital December 17, 1906 Family history negative

Previous history—Delivered of a healthy child three weeks ago after a normal labor Puerperium apparently normal until about one week ago, when child refused to nurse, and patient noticed that both breasts were enlarged, painful, and tender to touch Nursing stopped In a few days a small surface appeared on each breast just below the nipple, which was extremely tender and painful and which spread with great rapidity The leaves of some plant were applied to both surfaces

Present condition—Skin of face a peculiar yellow color, with bright, flushed cheeks, pupils contracted, tongue dry, tremulous, and coated in patches, lungs, broncho-vesicular breathing over anterior surface both sides, with few moist râles, respiration 62, heart, both sounds weak, first sound seems somewhat blurred, very rapid, slightly irregular, pulse 140, slightly irregular, fairly good volume, not compressible, abdomen negative, pelvis negative, temperature 104° F

Breasts—Both were the seat of extensive ulceration of an irregular horseshoe shape, with the nipples in the centre (Figure 1) The ulcers measured approximately 20 cm from side to side and 10 cm from above downward and were scarcely more than 15 cm deep at any point The edges were sharp, gnawed out and undermined, the surfaces covered with dirty, grayish, sloughing tissue, with but little discharge—a typical picture of phagedenic ulceration The process had attained its present dimensions in four days The glandular tissue proper of the

breasts was soft and presented no evidence of any inflammatory involvement

Smears and cultures from the ulcers showed a mixture of staphylococci streptococci and pneumococci. A blood culture revealed the presence of staphylococci and a gram negative bacillus resembling the bacillus typhosus. The leukocytes upon admission were 15 200 two days later 9 600. Urine 1007 albumin present granular casts.

The ulcers were thoroughly cauterized with pure bromine which stopped the process at once. The accompanying plate gives a fair idea of the appearance of both breasts several days after cauterization and after the separation of most of the sloughing base. It is worthy of note that the areola surrounding the nipples appeared to offer a more effective barrier to the spread of the disease than other portions of the skin as shown by the shape of the ulcers. The patient failed rapidly and died January 4 1907 from toxic nephritis and diarrhoea. It is regretted that no autopsy was permitted.

CUTANEOUS HORNS

A REPORT OF THREE CASES

BY CHARLES K ROYS, M D,
OF WEIHSIEN, CHINA.

THESE cases seem worthy of notice, not merely as surgical curiosities, but as giving some light on the connection between horns of the skin and epithelioma. In one case at least of those here given (No II), the two processes of horn-production and extension of an epitheliomatous ulcer, could be seen going on side by side. Any reference to the etiology, pathology, or general literature of this subject would be superfluous so soon after the excellent article in ANNALS OF SURGERY, June, 1906, by Nietert and Babler of St. Louis. So the present writer will confine himself to the simple clinical report of his cases.

The fact that these cases occurred in native Chinese does not prevent their having a bearing on the problem stated above. Nor does the fact that all three cases were seen within six months time, indicate that this trouble is especially common among the Chinese. Practitioners of long experience in China tell me they have never seen a case. This may be said, however, that such cases go untreated much longer here than in countries where medical and surgical aid is more readily accessible, so that end-results of pathological conditions are more often seen.

CASE I *Cutaneous Horn Lobe of Right Ear Excision* — A man, aged 67, had from childhood a small, warty mass on the back of the lobe of his right ear. It grew slowly till he was over 50 years of age, but for the past 12 years it has been growing more rapidly, producing a hard, painless projection, often cut off by the patient with a knife. Two years before admission, it fell off leaving a rough, irregular base, about 1 inch in diameter. In two years it grew again to its present size. It caused pain

FIG 1



Cutaneous bone of auricle

when pulled or moved so that the patient carried it suspended in a cloth bag which hung from his ear

On examination the man appeared fairly well nourished and healthy with nothing abnormal except the above mentioned horn. This was a black moderately hard projection hanging loosely from the lobe of the right ear and the adjacent skin over the mastoid process. It was attached to the skin only and had stretched the lobe of the ear to a length of about two inches. It was curved like the letter J measuring 9 inches around the curve and $2\frac{1}{2}$ inches in circumference at the base. Its surface was smooth and moderately hard near the base it was rough with longitudinal grooves and striations partly filled with sebaceous matter and dirt not having been washed in the two years of its growth. The skin at the base was red and tender with no ulceration but with fleshy projections $\frac{1}{4}$ inch in height close around the base of the horn which was slightly separated from these projecting papillæ and from its base on one side. No lymphatic enlargement (Fig 1)

Treatment—Excision under cocaine anæsthesia cutting off the redundant lobe of the ear and going through healthy skin $\frac{1}{4}$ inch wide of the base of the horn

Note—The longest horn referred to by Nietert and Babler was in Soubervielle's case with a length of 10 inches. The rate of growth is not stated. In Case I of this series the horn grew 9 inches in two years

CASE II Cutaneous Horn of the Lip Becoming Epithelioma. Excision of $\frac{3}{4}$ of lip and Right Submaxillary Lymphatics—A man 60 years of age had for 20 years a hard painless mass growing from his lower lip just to the right of the median line. He gave no history of syphilis traumatism or other possible cause. When the mass grew large enough to interfere with eating he would cut it off with a razor. He estimated that he had cut off about 2 inches in this way. He was a constant smoker of a long pipe with a metal mouth piece which he always held on the left side of his mouth to avoid the growth. For the last two years he noticed a lateral growth of the mass across his lip to the left in addition to the longitudinal growth of the horn. The lateral growth was painful on pressure and sometimes the seat of spontaneous shooting pains. It was usually covered with a crust and sometimes bled

On examination the man was found in fairly good condition, with the exception of his lower lip. On the vermillion border of the lip, just to the right of the median line, is the small, truncated, horny mass mentioned above, about the size of a navy bean, its surface rough and cracked, the skin around it hardened and infiltrated, especially to the left along the free margin of the lip, which is involved to the left angle of the mouth in an ulcer with a hard nodular base, rough necrotic surface, and slight purulent discharge. At the anterior margin of the ulcer, beginning in the median line, and extending $\frac{3}{4}$ of an inch to the left, is a low palisade-like projection of horny tissue, about as thick as a finger-nail and $\frac{1}{4}$ of an inch high, of a shiny yellow color, and showing fine vertical striations like those seen on the finger-nails. According to the patient's account, the growth of this has proceeded *pari passu* with the growth of the ulcer across his lip. Submaxillary and cervical lymphatics not enlarged.

Treatment—Under chloroform anæsthesia, the entire contents of the left submaxillary triangle including the platysma were excised en masse. The wound being closed and protected, the left $\frac{3}{4}$ of the lower lip was excised, the defect being filled by a square lateral flap from the left cheek, procured by two horizontal incisions after the method of Malgaigne. The sutures were two of silver wire including the thickness of the lip, deep interrupted silk for the skin surface, and interrupted iodine catgut for the mucous membrane. The patient made an uneventful recovery.

Note—Paget's case (*loc cit*) showed "spur-shaped sharp-pointed projections about the base of the ulcer" (a soot-cancer). This case (No II), showed unmistakable horny tissue as part of an epitheliomatous extension from a primary focus of horn. I regret to say that the specimen was lost, and that the opportunity for histological examination was lost with it. It was also impossible to get a useful photograph with the small camera at the writer's command.

CASE III *Multiple Cutaneous Horns of Glans Penis Amputation*—A man 26 years of age had from childhood a growth on the right side of the glans penis. His habits were good, and he was effectually protected from venereal disease, as intercourse was made impossible by the growth. He first noticed a small pimple, which became a wart-like mass, and gradually multiplied itself spreading over the right side of the glans penis until there

were about 25 small hard horny projections. The upper $\frac{1}{4}$ of the mass grew much faster than the rest forming a long curved finger like projection which he cut off repeatedly with a knife because it caught in his clothing. He estimated the total growth at about 3 inches. The whole mass was painful if rubbed or struck. It did not interfere with micturition but quite prevented intercourse. As it is the duty of every Chinese to acquire male descendants he sought treatment to remove this disability.

On examination he was found to be a healthy powerful man normal except for his genital organs. The right half of the glans penis was occupied by a rough nodular mass. The upper $\frac{1}{4}$ of this mass was in the shape of a truncated pyramid $\frac{3}{4}$ of an inch square at the base and about 1 inch high showing longitudinal striations at the sides and a smooth cut surface at the top about $\frac{1}{2}$ inch in diameter. Below this and bounded by the sulcus were 25 or 30 wart like projections hard and horny and embedded in a crust from the ulcerated surface around and between them. These are limited to the right side of the glans except one which lies just to the left of the frænum below the meatus. The mass rests on a base about $\frac{1}{3}$ of an inch thick indurated and firmly fixed to the tissues of the glans. Lymphatics in both groins enlarged slightly tender soft and movable.

Treatment—Amputation of glans penis leaving corpora cavernosa almost entire and dissecting out urethra through glans almost to the meatus. Urethra split for a short distance on its under surface and margins united to skin by silk sutures. Recovery was uneventful.

Note—In Bellamy's patient (loc cit) the horn grew from the clitoris and resembled the claw of a lion. Size not mentioned. In this case the horn growing from the analogous organ reached a total length of at least 3 inches. The uncleanly habits of the Chinese may help to account for frequent disease of the glans penis. In the six months since opening the hospital of which the writer has charge there have been seen frequent soft and phagedenic chancres three cases of carcinoma and one of actinomycosis of the glans and prepuce.

TRAUMATIC HEMATOMYELIA,

WITH A REPORT OF A CASE

BY MILTON R BARKER, MS, MD,

OF CHICAGO

HEMATOMYELIA is a term applied to a hemorrhage that takes place within the substance of the spinal cord. It is always intra medullary. That we should fully understand this condition, we should briefly review the anatomy of the blood supply of the cord. The blood is supplied by three main arteries and their branches, one anterior and two posterior spinal arteries, all three of which are branches of the vertebral, they are given off from the vertebral near where these join to form the basilar. The two anterior spinal trunks unite in a single artery in front of the medulla, which extends the entire length of the spinal cord in front. It is imbedded in the pia mater and lies in front of the anterior median fissure. The two posterior spinal arteries pass from their origin to the postero-lateral borders of the medulla and proceed separately the whole length of the spinal cord, being located just behind the posterior nerve roots. These arteries are also imbedded in the pia mater. The spinal arteries receive accessory branches along their course from the thyroid, intercostal, lumbar and ilio-lumbar arteries, through the intervertebral foramina, and give off numerous branches to the substance of the cord, through which the cord receives its vascular supply. As before noted, both the anterior and posterior spinal trunks are imbedded in the pia mater, hence are external to the cord. Therefore all hemorrhages that may take place from these trunks will not produce hematomyelia. If the rupture in the arterial wall is so located that the bleeding takes place into the subarachnoid space, hematomyelia does not result. In other words, the hemorrhage must take place in such a manner that the cord substance is invaded by it to produce hematomyelia. In hema-

tomyelia the damage is usually wrought in the gray columns of the cord these offering the least resistance to the flow of blood yet in some cases in which the hemorrhage is profuse the white tracts are invaded but in these cases the blood does not follow the white tracts for any considerable distance the axones acting as a barrier to its progress

The ætiological factors in the production of hematomyelia are diseased conditions of the arterial walls for instance arteriosclerosis or conditions due to specific disease and traumatism The former may be present the latter is always present The hemorrhage may be in the traumatic area or remote from it the latter usually prevailing in uncomplicated cases When the hemorrhage takes place in the traumatic area the bony wall of the spinal canal is either crushed and splinters of bone pierce the substance of the cord or it is pierced by knife or bullet wounds In these cases much damage is wrought to the bony wall membranes of the cord and the cord itself and the hematomyelia thus produced is only a part of the general destruction While hematomyelia exists in these cases it is not that uncomplicated form the symptoms of which are at times obscure and the diagnosis difficult nor that form which we wish to emphasize in this paper

The form of hematomyelia with which we are dealing takes place in the cervical cord remote from the traumatic area and usually follows the violence immediately but may be postponed for several days or weeks Its constant site in this class of cases being the cervical region by reason of the fact of the great mobility of the spinal column in this region Traumatism applied to the nates by falling or by being struck by ponderous bodies or applied to the lumbar or dorsal regions producing a sudden exaggerated extension or flexion of the cervical spinal column may rupture either the anterior or posterior spinal arteries by over stretching or by forcibly dragging them against the bony wall of the spinal column If the arterial walls are diseased the chance for their rupture is greatly enhanced The traumatic insults in this class of cases may be severe or so slight as to escape detection by external

appearances In those cases in which the hemorrhage immediately follows the injury, the walls of one or more of the arteries are completely ruptured, but in that class of cases in which the hemorrhage takes place at some rather remote time, as several weeks or two months after the injury, it is probable that at the time of the injury, while the walls of the arteries are not completely ruptured, that their coats are so injured that they later give way, or perhaps only the intima-vasorum is ruptured, an aneurism following, which later ruptures producing the hematomyelia I believe the above is a reasonable solution of these postponed hemorrhages These vessels at the point of rupture are subjected to considerable blood pressure, being in quite close proximity to the heart

As before noted, the damage to the cord is usually confined to the gray columns, and may be much or little according to the amount of bleeding If the hemorrhage is considerable it will push its way through the gray columns for a distance of three or four segments of the cord above and below the bleeding point Should the hemorrhage involve the third, fourth and fifth cervical cord segments, serious results will follow, the nerve centres of the phrenic being involved and paralysis of respiration resulting In the form of hematomyelia of which we are speaking the upper extremities, and the rest of the body below the lesion, will be more or less involved and more or less permanently involved, according to the amount of bleeding that has taken place into the cord

These hemorrhages may be divided into four categories as follows, local, profuse local, disseminated, and profuse disseminated The neuroglia tissue in the gray columns of the cord offers greater resisting force to the flow of blood in some cases than in others Hence in those cases where there is a marked resistance by this tissue, the blood does not make channels between the fibres of the neuroglia tissue and become disseminated through the gray columns, for the distance of a number of cord segments, but pushes the neuroglia tissue from it on all sides, stretching and breaking down its fibres and thus forming a pool of blood or perhaps several pools, which

pools form clots that occupy more or less completely the gray columns for a space of perhaps three or four cord segments in close proximity to the bleeding point. The pressure of these clots upon the delicate tissues of the neurons causes softening and destruction of them. When the mass of blood clot and dead neurons is absorbed cavities are left in the cord substance and the functions of that part of the system presided over by these nerve cells and axones are permanently lost. These cavities in the cord later fill up with connective tissue. The larger the clot the greater will be the destruction of nerve tissue and the greater the loss of function. A small local hemorrhage may produce little or no permanent damage while a profuse local hemorrhage will cause permanent loss of function over a large area of the system. In the disseminated hemorrhage the blood makes its way between the neuroglia fibres and about the cells in the gray columns permeating the substances of these columns for a distance of eight or ten cord segments but pools of blood do not form hence there are no clots to produce pressure and destroy nerve tissue. Hence permanent loss of function does not follow this form of hemorrhage while in the profuse form of disseminated hemorrhage clots form throughout the disseminated area and produce pressure on the nerve cells and axones causing softening and destruction of them and when these small masses are absorbed numerous small cavities are left in the cord substance and permanent loss of function occurs over numerous areas of the system more or less remote from each other.

Some of the important things to be remembered in connection with hematomyelia are first profound general conditions that may follow apparently slight traumatism applied to the spinal column in such a way as to cause extreme extension or flexion of the cervical segments of the cord. Second profound conditions involving the cervical cord due to traumatic insults perpetrated at a distance remote from the cervical region. Third the cord lesion may appear many days or several weeks after the traumatic insult is received. Fourth if the hemorrhage is profuse and local permanent damage to

function will result to large contiguous areas in both upper and lower extremities, while if the hemorrhage is profuse and disseminated, permanent damage to function will result in many areas, in both upper and lower extremities more or less remote from each other. If the hemorrhage is small and local, or slight and disseminated, no permanent damage to function will result. Fifth, all forms of hematomyelia improve for about eighteen months, after that little improvement may be expected. Sixth, a guarded prognosis should always be made.

As to the diagnosis of this condition we have no means at our command for making anything more than a probable diagnosis of hematomyelia. Lumbar puncture in suspected cases has been advocated, but as a matter of fact is worse than useless. If blood should be found by this measure in the cerebro spinal fluid, it would not be of diagnostic value, as it would only prove that hemorrhage had taken place into the subarachnoid space, the only portion of the spinal canal, normally occupied by cerebro spinal fluid.

In a hypothetical case, in which paralysis of a portion of the upper and lower extremities, followed immediately a traumatism to the spinal column, remote from the cervical region, the paralysis increasing in extent and severity for several hours after the violence, without cranial nerve involvement. In a youthful patient free from disease, we would be justified in making a diagnosis of hematomyelia, but even in such a case we would think of hysteria as a possible cause of the condition, while in another case less clear, we would have to consider the possibility of scattered foci or morbid tissue changes in the cord due to latent degenerative changes, which have become active by reason of the traumatic insult. As a rule, however, the difficulties are greater in making diagnosis in real cases than in the hypothetical ones. Nevertheless with disseminated inhibition of physical function, in the upper and lower extremities, with increased reflex activity, and exaggerated tremors, following traumatism to the spinal column, more or less remote from the cervical region with no cranial

nerve involvement a diagnosis of hematomyelia is the most probable. If the symptoms of hematomyelia do not appear until a time more or less remote from the date of injury differential diagnosis is more difficult for the reason that more time has been provided in which latent degenerative conditions may become active. Even after the lapse of eighteen or twenty months we may not be able to decide positively what was the true condition.

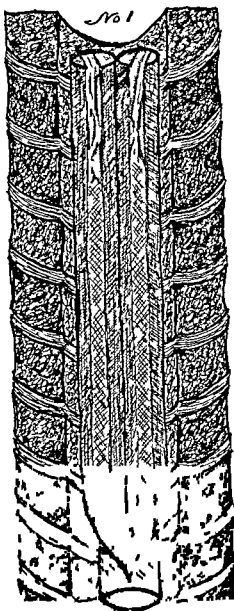
In slight hemorrhages either local or disseminated the patient will completely recover. The same result will follow hysteria as a rule hence complete recovery does not decide for hematomyelia. In profuse hemorrhages the patient will improve for a time but never fully recover. The same may occur in degenerative conditions. Hence we believe in a majority of cases we will not be able to make anything more than a probable diagnosis of hematomyelia either at the beginning or end of the case.

The following illustrates a probable case of hematomyelia the hemorrhage being postponed profuse and local.

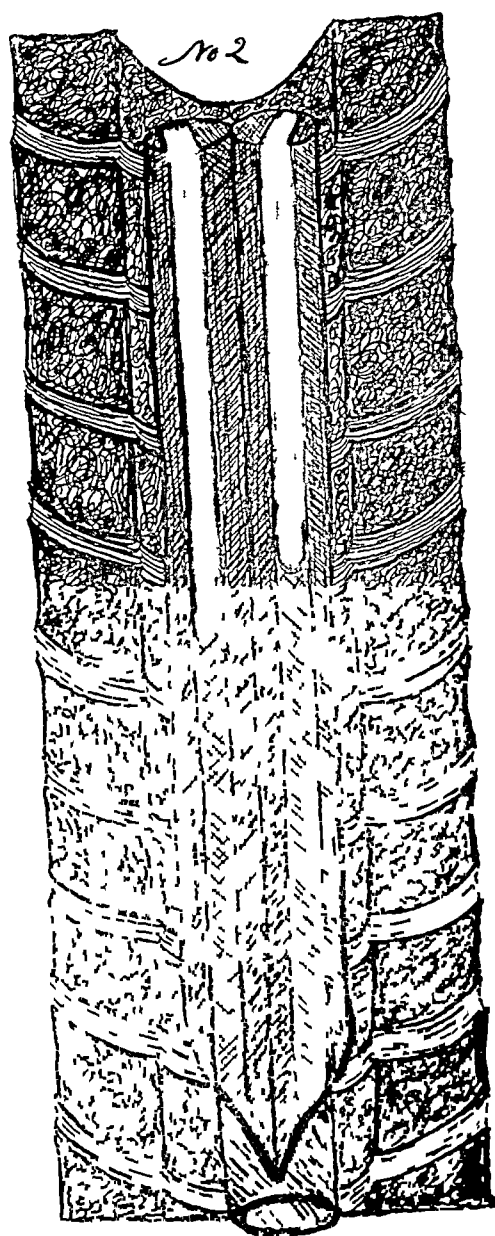
Mr J. aged 33 years teamster by occupation denies having had any venereal disease or illness of any kind. Patient was thrown from his wagon striking his back a little to the left of the spinal column on the curbstone sustaining a fracture of the seventh and eighth ribs near the column. I saw this patient a few moments after the injury occurred. The fractured ribs were cared for in the usual manner. The patient made a rapid recovery and in six weeks resumed his duties as teamster. Eight weeks after the injury while caring for his team preparatory for the day's work suddenly and without warning his lower limbs gave way and he settled down in a bunch on the barn floor. Two neighbors who happened to be present tried to assist him to his feet but found that he had lost the use of both upper and lower extremities. He was perfectly conscious could talk without difficulty and knew all that was going on about him. His friends carried him into the house and put him to bed. I saw the patient a half an hour later. Sensation and motion were lost in the entire right lower limb so profound was the condition in

this limb, the patient could not tell where it was unless he could see it. Motion was lost in the left lower limb below the knee and greatly impaired above the knee, but not entirely lost. Sensation in this limb was not completely lost, patient could tell when his left limb was moved and would respond to the prick of a pin. The right arm was paralyzed over the areas supplied by the musculo spiral, median and ulnar nerves, while the left arm was paralyzed over the areas supplied by the musculo spiral and median nerves. There were none of the cranial nerves involved, and the functions of micturition and defecation were at no time involved. Some little improvement in sensation commenced in the area supplied by the ulnar nerve three months after the paralysis occurred. Two months later both arms commenced improving over the entire areas involved. At the end of six months some improvement commenced in the lower limbs. Sensation began to appear in scattered areas over the right leg. At the end of twenty months the patient was able to use his arms in a manner—he could feed himself and partially dress himself, and use a cane in each hand. He had also regained the use of his limbs so that he could walk in a way. He had better use of the limbs above than below the knees. He walks by raising the limb above the knee and then swinging the lower limb forward. It has now been about thirty-four months since the injury, but there has been no improvement for fourteen months. At the time of the injury the patient weighed 180 pounds. Six months later he weighed 120 pounds and at the present time weighs 140 pounds, but has not gained any in weight for a year. The knee jerk is exaggerated at the present time, while the Argyle-Robertson pupil and Romberg's sign cannot be demonstrated. This patient has never suffered pain, has never had a rise of temperature, and the pulse and respiration have always been normal. Neither has there at any time been tenderness anywhere along the spinal column or any discoverable abnormality connected with it.

It is impossible for us in this case to positively associate the traumatism with the hemorrhage that occurred at so remote a period. We are well aware that hematomyelia occurs sometimes without traumatism, but in such cases the arteries are diseased. In the case presented there are no evidences of dis-



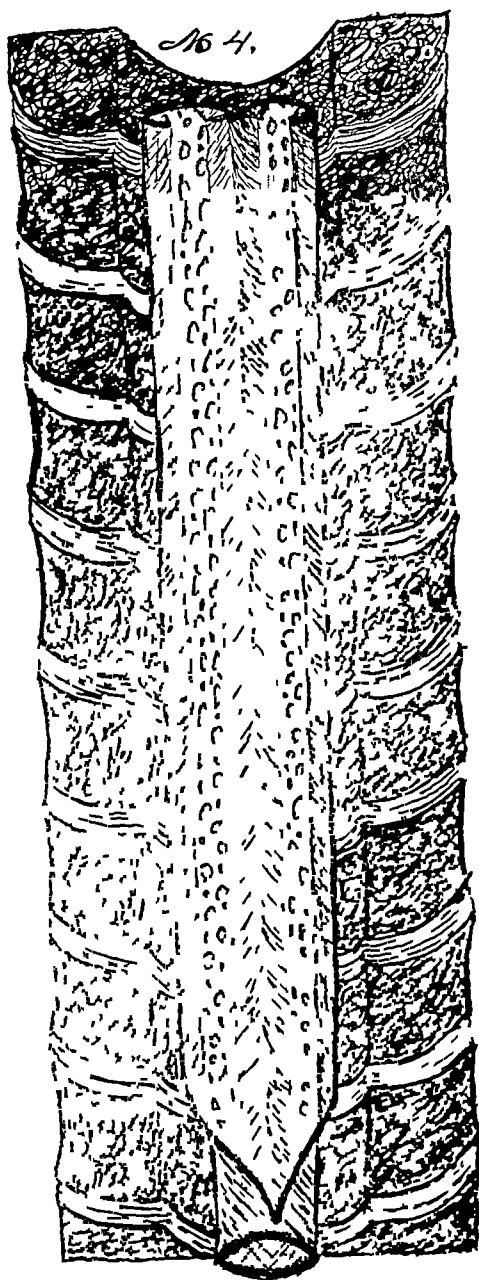
Slight calh m rth g



Profuse local hemorrhage



Slightd semi ted h m rrh g



Profuse disseminated hemorrhage

ease We may regard the case from two view points Was the hemorrhage due to the traumatism or did it occur independently of it? In other words would this patient have had his hemorrhage if he had not received the injury? Which is the more reasonable of the two conditions? To me the former is overwhelmingly impressed as the true one

It is only comparatively recent that hematomyelia has been recognized as a pathologic entity For many decades it was one of that group of unknown conditions (except symptomatically) known as railway spine How many conditions were contained in this group is not known but it is certain that one of the most important of the group was removed from it when hematomyelia was identified and placed in a category by itself We now find ourselves facing a new danger that nearly all cases that were once known as railway spine are now placed or in danger of being placed in the category of hematomyelia As a precaution against this we can do no better than quote from Leube The diagnosis of spinal apoplexy should only be made with the greatest reserve The sudden onset of the disease the apoplectiform appearance of paralysis the most important support for the diagnosis are also noted in other affections of the cord especially now and then in acute myelitis Only when certain etiological conditions simultaneously are in favor of the diagnosis of spinal cord hemorrhage a fall a severe blow upon the back fracture of the vertebræ the existence of a marked hemorrhagic diathesis or of a atheroma a little more certainty in the diagnosis is permissible.

The drawings Nos 1 2 3 and 4 illustrate a section of the spinal column with a portion of the arch of each vertebra removed revealing the cord in the spinal canal The cord is laid open at the posterior median fissure and each side turned half over showing the hemorrhage in the gray columns in each side of the cord

NERVE DISASSOCIATION; A NEW METHOD FOR THE SURGICAL RELIEF OF CERTAIN PAINFUL OR PARALYTIC AFFECTIONS OF NERVE TRUNKS¹

BY W WAYNE BABCOCK, M D,

OF PHILADELPHIA,

Professor of Surgery and Clinical Surgery in the Medical Department of the Temple
College, Surgeon in Chief to the Samaritan Hospital, Surgeon to the
Garretson Hospital

Summary—The following is a preliminary report giving the results obtained in treating certain forms of paralysis or paræsthesia due to injury or inflammation of nerve trunks by isolating the affected part of the nerve through an incision, freely opening the nerve sheath, disassociating the component fibers, and isolating the nerve from later fibrous tissue compression. The neurolysis is intended to permit the escape of exudate from within the nerve sheath, to reduce pressure upon individual nerve fibers, to free axis cylinders which have become useless through entanglement in scar tissue, to facilitate the formation of new or the restoration of old nerve paths, and to stimulate desirable trophic changes in the nerve trunk.

The influence of pressure within the nerve sheath as a cause of palsy and anæsthesia was brought to our notice in November, 1905, by a patient who had sustained a small incision of the median nerve from a piece of flying glass. On exposure of the injured nerve it was found that the nerve was not divided, but was the seat of a marked fusiform enlargement. Upon incision of the affected area there flowed from between the nerve fibres a gelatinous and serous fluid. In this patient nothing was done except to make a free longitudinal incision into the nerve. Four days later, upon testing the hand it was found that the area of anæsthesia had decreased

* Read in part before the Northeast Branch, Philadelphia County Medical Society, February 18, 1907

one third and that there was a distinct increase in the ability to flex the fingers. The prompt improvement in this patient was very suggestive and later we gradually developed a method of treating certain forms of neuritis that have produced paresthesia or paralysis and also a possible means of inducing regeneration along nerve paths blocked by areas of cicatricial tissue. Unfortunately our experience with this new operation while encouraging has been limited to four cases and this preliminary report is made therefore with the hope that a wider application may more precisely determine its field of usefulness.

Technique of the Operation—After sufficiently exposing the affected nerve through an incision the nerve is isolated from adjacent tissues and a free longitudinal incision of the nerve sheath made. The sheath should be divided if possible well beyond the limits of the lesion. The nerve trunk is then lifted upon one or two fingers held taut and the nerve fibers carefully separated from each other by means of a small sharp tenotome. Care is taken to divide as few nerve fibers as possible although it is aimed to freely separate the nerve fibers from each other. As the nerve fibers become separated the nerve is transformed from a rounded cord to a flat ribbon like band of separated fibers. If cicatricial tissue is encountered in the nerve trunk the separation of the fibers is prolonged along straight lines dividing the scar into multiple parallel threads of tissue. Having freely disassociated the nerve fibers if the nerve were previously imbedded in cicatricial or fibrous tissue it should be removed from this area or at least isolated from future cicatricial adhesions by the interposition of adipose tissue strips of which can usually be secured from beneath the skin. In one of our cases the musculo spiral nerve was transplanted from the musculo spiral groove into the subcutaneous fatty tissue. In two other cases we have laid thin strips of adipose tissue between the nerve and its normal bed. Of seven cases in which we have partially or thoroughly disassociated nerve fibers in only one were we able to detect an increase of the paralysis immediately following the operation while in

several there was an almost immediate increase of function in the affected nerve field. In three instances the nerve trunks were split for purposes of nerve transplantation. During the operation it is important that the nerve be handled gently, be not subjected to strong traction, and that the knife be sufficiently sharp to separate, without unnecessarily pulling, tearing, or bruising the nerve fibers. Theoretically, it may be assumed that the operation may be of benefit in a number of ways as follows

FIRST The relief of tension within the sheath—The free disassociation permits the immediate escape of interfibrillar exudate. The pressure of the constricting nerve sheath is relieved, intraneural collections of fibrous tissue are divided and constricted nerve fibers freed. This is well shown in Case 1.

SECOND The operation may be useful in permitting a rearrangement of nerve paths—In the process of disassociation it is inevitable that many axis cylinders will be divided or torn free from their connections. Thus there is left along the tract of the operation, numerous free ended axis cylinders in condition to form new anastomoses with a possibility of the reestablishment of many nerve paths previously interrupted. For example, in brachial birth palsy, or after traumatic division of nerves, the divided nerve fibers may become entangled in the new forming connective tissue and remain buried and incapable of function. In the process of disassociation these nerve fibers are freed from their entanglements, divided, and are left adjacent to other divided fibers, with some of which they may anastomose, reestablishing the function, or again, other divided short segments of nerves may by forming attachments at each end serve as bridges over the gap caused by the injury.

THIRD The operation may facilitate the bridging of cicatricial gaps in nerves—If a nerve has been divided and the ends finally joined by a mass of scar tissue, say one-half inch or more in length, the separation and freeing of nerve fibers above and below the fibrous area, and the splitting of the

cicatricial connecting band into threads of tissue with innumerable interspaces between should theoretically at least place the freed axis cylinders in a most favorable condition for growth and ultimate anastomoses along the guiding trellis like strands of fibro-connective tissue. It would seem that such a fibrillated fibrous bridge should give much better results than where the divided and separated nerve ends are bridged by catgut or other foreign material. Moreover all residual nerve filaments are conserved and there is no sacrifice of nerve tissue such as occurs when the cicatricial area is excised or resected. While after primary nerve injuries the immediate exudate and hæmorrhage may be prejudicial to anastomosis in nerve disassociation the field is practically free from blood the opportunities for drainage are good and there should be little interference by the pressure of exudates.

CASE I—*Partial division of the median nerve with localized infiltrative neuritis. Prompt partial return of function after incision into the nerve*—M. G. 32 years old. Well nourished. Previous history negative. In September 1905 a piece of glass from an exploding bottle of soda water made a short incision about two inches above and one inch internal to the line of the internal condyle of his left arm. This was followed by inability to flex the index and second fingers and anesthesia of the entire palmar surface and the terminal portions of the dorsal surfaces of the first two fingers. There was no paralysis of the thumb and adduction and abduction of the fingers were retained. Two months later the patient had partially regained the power of flexion of the second finger. On November 22 1905 the patient entered the Samaritan Hospital. The median nerve was exposed opposite the superficial scar. In this area the nerve showed a grayish fusiform expansion of about three times the calibre of the normal nerve. This enlargement of the nerve trunk was freely incised in a vertical direction and a marked gelatinous and serous infiltration between the fibers found. The wound was closed in layers without drainage. Four days later the area of anæsthesia over the palmar surfaces of the finger was found to have decreased about one third. He could partially flex the first finger at the knuckles but not at the interphalangeal joint. After

this immediate improvement there was little change for ten months. Recently a progressive increase in power has been reported. In this case the thorough disassociation of fibers used in the later cases was not carried out.

CASE II—Progressive musculo-spiral neuritis following traumatism. Nerve-stretching, temporary relief from pain and complete palsy of musculo-spiral nerve. Nerve disassociation, with immediate partial return of motion and relief from pain, secondary return of some of the symptoms, and final progressive improvement.

History—A S, 32 years old (Patient of Dr W A Steel) Mill hand. Previous history negative.

History of Neuritis—Six years ago patient fell from a bicycle bruising an area over the left musculo-spiral groove. Following the injury an intermittent neuralgia appeared in the field of the musculo-spiral nerve and continued for five years. Ten months ago the neuralgia became constant and there was a gradual decrease in the power of the extensor muscles of the forearm. Rest, counter-irritation, and internal medication failed to relieve the symptoms.

Operative Treatment—In September, 1906, the patient entered the Samaritan Hospital, the nerve was exposed in the musculo-spiral groove (Dr Steel), freed from its adhesions and stretched. Complete musculo-spiral paralysis followed the operation. The pain was relieved for a few weeks, but gradually returned with increasing severity. There was partial ability to flex the fingers and thumb (median and ulnar nerve), but this was impaired. Electricity and massage were used. Three months later, the pain continuing with great severity, the nerve was exposed (Drs Steel and Babcock) over a distance of seven inches and it was found shrunken and grayish in color and adherent over an area one inch in length corresponding to the site of the injury. The nerve was isolated, the nerve sheath opened, and the nerve fibers freely disassociated from the upper fourth of the humerus to the elbow. The nerve was then lifted out of its groove between the heads of the triceps and transplanted into the deep subcutaneous fat. The immediate effect of the operation was relief from the pain and the ability to extend the fingers and wrist from the splint, indicating some restoration of the musculo-spiral function. About a week later there was a

partial return of the pain and this continued for two months after the operation when the nutrition of the hand and forearm having improved there was a gradual cessation of pain and return of power. Three months after the operation there was no pain in the peripheral distribution of the musculo spiral nerve but some tenderness and pain in the axilla and over the clavicle. Flexion extension and rotation of the hand and fingers are nearly perfect. Electricity and passive motion have been used beginning two weeks after the operation. In this case the striking features are the immediate disappearance of the wrist drop following the neurolysis second the return of pain and loss of power probably from the exudate poured out during the reparative process and the final relief from pain except in an area proximal to the field of operation.

CASE III—Intractable sciatica. Nerve stretching followed by temporary relief from pain and complete palsy. Return of pain. Disassociation of posterior tibial nerve followed by partial return of motion in twenty four hours and relief from pain in the field of the disassociation.

History—S. K. age 21 single. Factory girl. Previous history negative. Had suffered with neuralgic pains along the course of the left sciatic nerve for eight months not relieved by various constitutional and local measures including injections about the nerve trunk. She had also been in one hospital for treatment for six weeks and in a second for one week. October 24 1906 about eight months after the development of the pain she entered the Samaritan Hospital and the day following under spinal anæsthesia by stovaine the left sciatic nerve was exposed and thoroughly stretched. The operation was followed by immediate relief from pain and complete paralysis of the leg and foot. Six days later the patient began to complain of some return of the pain. As the pain continued and proved progressive especially in the calf of the leg on November 26 about one month after the first operation the patient under spinal anæsthesia by tropa cocaine was treated by exposure and thorough disassociation of the upper third of the posterior tibial nerve. The nerve was then insulated by strips of adipose tissue taken from under the skin and the wound closed in layers without drainage. Twenty four hours after the operation there was ability to flex the toes one fourth of the normal range. There

was wound soreness, but relief from the neuralgic pain, later there was some return of the pain in the foot, which subsided under hot baths, so that the patient is now nearly free from severe pain in the leg, although there are some pains about the upper thigh and hip. There is anæsthesia of the anterior surface of the foot and leg, while sensation is present over the posterior surface, and there has been a gradual subsidence of the paralysis. There was in this case, therefore, a partial but immediate return of function in the distribution of the nerve operated upon, which has persisted, while anæsthesia continues in the distribution in the anterior tibial nerve, the branch not treated by disassociation.

CASE IV — Intense neuritis of the forearm chiefly involving the field of the median nerve. Disassociation of median nerve followed by increase of paralysis, but marked relief from pain. Gradual resumption of power and increasing relief.

Mrs H. T., age 48, previous history negative except two attacks of typhoid fever about the age of puberty. A year ago, one month after moving into a damp house, she noted a sensation of coldness in the posterior surface of the left hand, between the thumb and index finger. The application of water would produce a chill. Increasing lancinating pains shooting from the tip of the index finger along the inside of the arm to axilla developed, with tenderness. The fingers became stiff, could be flexed only partially and at times not at all. The third and fourth fingers remained normal. The pain became so intense that for nine weeks preceding her entrance to the hospital, three hypodermics of morphine were injected into the arm daily. At the Samaritan Hospital, March 26, 1907, the lower third of median nerve in the arm, and likewise the lower half of median nerve in the forearm were exposed by a longitudinal incision above the elbow and one above the wrist, isolated, the nerve sheaths carefully divided and the nerve fibers thoroughly disassociated. Following the operation there was a loss of motion of the first two fingers and thumb, with a sense of marked anæsthesia. The pain was much less intense and the tenderness much reduced. There was some return of motion within a week. Three months after the operation the patient could sleep comfortably at night, had partial flexion of all fingers, some sense of anæsthesia, and increasing freedom from pain. Future experience may prove that it is unwise to disassociate two areas of a single nerve trunk at one time.

Of the four cases in which an operative disassociation of nerves was carried out three were for painful conditions and these patients obtained marked relief by the operation. In all four there were paralytic symptoms and in three of these cases there was an immediate decrease in the palsy following the neurolysis. In the remaining case one in which a single nerve was disassociated along two different areas there was a transient increase in the paralysis. In two of the cases nerve stretching had previously been employed had failed to give continued relief and had produced immediate palsy. For the present we may conclude

First—That the surgical disassociation of nerve fibers may be carried out without producing gross evidence of reduction in the conducting power of the nerve.

Second—Disassociation probably is not as apt to produce paralysis as thorough nerve stretching.

Third—That in certain cases of neuritis nerve disassociation is less dangerous and more potent in relieving symptoms than nerve stretching.

Fourth—In certain cases of motor paralysis following inflammation or injury of nerve trunks disassociation may be followed by a remarkable and almost immediate return of some of the function.

Fifth—In the treatment of certain forms of peripheral paralysis due to interruptions of nerve paths by masses of fibrous or other tissue the operation of nerve disassociation from its apparent safety and conservatism is deserving of trial. Especially do we feel that it is warranted in cases of brachial palsy where no gross lesion is found in the nerve trunks or where extensive resections anastomoses or forms of nerve bridging by catgut or other foreign materials would otherwise be employed.

OPERATIONS ON THE SPINAL COLUMN.*

BY WILLIAM STEVENSON BAER, M D,

OF BALTIMORE MD,

Associate in Orthopedic Surgery in the Johns Hopkins Hospital and University

OPERATIONS upon the spinal column have been numerous, but they have been mainly for the purpose of getting within the spinal canal rather than as operative procedures upon the spine itself. The clinical picture presented by pressure on the spinal cord, whatever the cause may be, is always of the greatest interest. This, I fear, has more or less diverted our attention from a proper consideration of the external aspect of the column, and we have failed to realize that it is the seat of changes which demand operative interference. Consider for a moment the anatomical structure of the spinal column. How great is its length, extending as it does from the skull in its upper portion to the coccyx below, a distance in the average adult varying from 65 to 80 cm, or between two and two and a half feet. Think of the number of its component parts each a distinct unit and liable to the changes from trauma and infection as other bones of the human frame. Look at the great number of joints which are present, which are of two characters, both arthrodial and amphiarthrodial. While their individual amount of motion is extremely small as compared to many other joints of the body, nevertheless, they are prone to many of the changes which cause serious trouble in other articulations. Each individual vertebra is attached to its neighbor by five sets of ligaments, and these are peculiarly susceptible to certain forms of infection, as those produced by the gonococcus. The normal elasticity of the ligament is diminished and a semi-calcareous strand takes its place. After traumatism these ligaments may be pulled away from the vertebral bodies stripping off portions of the periosteum, and form exostoses

* Read before the American Orthopedic Association, May 9, 1907

of greater or less dimensions. These exostoses may be anatomically situated so as to interfere with the normal motion of the spine and cause pain by impingement of the nerve roots as they emerge from the spinal column. The point of attachment of muscles or of tendons has always been a seat of injury following violent traumatism or strain. The periosteal covering of the bones at these points is injured and permanent damage is often done. When one considers the large number of muscles that are attached to the spinal column throughout its extent and how very small is the surface of the vertebra free from such muscles, is it surprising that under constant strain which the continual motions of the spine necessitate that there are areas of lessened resistance, the starting point of future trouble? Consider again the relation of the vertebra to important neurological structures as the cervical and lumbar plexuses and the various intercostal nerves. How narrow is the lumen through which these nerves pass and how closely are they pressed by the numerous ligaments which hold the adjacent vertebrae together! Proliferations of the edges of these intervertebral articulations press directly on them. The contiguity of the nerve elements to the bony structure of the spine offers opportunity for nerve lesions which have in many cases been put down to a true inflammatory neuritis.

The radiograph has marked a distinct advance in our knowledge of the congenital defects in the spine and of its numerous variations from the normal which often have a clinical significance. Spina bifida is well known. This is caused when the laminae of a particular vertebra fail to coalesce. It presents however such gross external appearances that the radiograph was not necessary to determine its embryological origin. The small variations however resulting in most painful though often obscure symptoms have been brought to light only since the routine use of the X ray. Thus far has our knowledge concerning the cause of symptoms referable to the brachial plexus been cleared up. Numerous instances of the presence of a cervical rib or ribs unilateral or bilateral are now of such common occurrence that no further mention need be made of

them, but the fact that certain types of neuralgia are due to the pressure of the cervical ribs directly on the plexus has led to the excision of this anatomical variation with complete cure of that group of cases which has for so long a time defied therapeutic remedies. The cervical portion of the spine is the main location of the extra rib, but it is by no means confined to this area. Any of the lumbar vertebræ may possess a rib. Generally when this occurs it is the first lumbar vertebra which is involved and symptoms of pressure on the lumbar plexus result from it, and the cause of these symptoms would be almost impossible to make out unless a radiograph were taken. Any of the five lumbar vertebræ may possess such an appendage, and one of the cases which is the cause of this paper had an extra rib coming off of the fifth lumbar vertebra extending down into the pelvis and was densely adherent to the lumbar sacral cord. It produced a sciatica which defied all kinds of therapeutic treatment for years. Besides the presence of extra ribs other malformations are often met with. Indeed the spinal column has probably more variations from the normal than any other bony structure of the human body. Often the different centers of ossification of the body of the vertebra fail to fuse and the vertebral body remains in two parts between which there is a cleft going directly down to the spinal canal. At times the two sides of the vertebra differ materially in size. It is claimed by some that lateral curvature is due to this asymmetrical development. From Mall's statistics on the embryo one is surprised how often there is a variation from the normal in regard to the number of vertebræ present. Besides the variation in number Bohm before this society at its meeting last year pointed out that the ribs while the same in number on both sides of the spinal column were often asymmetricaly placed, that is, the ribs on one side of the spine might often be one vertebral body higher than those on the opposite side. This leads to a great many variations in regard to body development. Instead of one rib springing from each side of the dorsal vertebræ two may come off of one side while one comes from the other. This confinement of two ribs within

a restricted space at their point of origin may cause both sensory and motor disturbances as they press upon the emerging nerves

Trauma is another cause of certain conditions in the spine which at times necessitate operative interference for the alleviation of their symptoms. We operate on fractures of the spine in order to remove the fragments causing pressure on the cord or on the nerves after they have passed through the spinal column. A rupture of the ligaments and the tearing of muscles cause periosteal thickening and fibrous and bony enlargements which impinge upon neurological structures or press so hard upon neighboring bony projections with the least movement of the spine that they must be removed before permanent cure will result. Another and probably the most important cause of changes in the spinal column where operation is indicated for the relief of symptoms is the various infectious processes and metabolic disturbances. The gonococcus is the organism most often found in the production of these changes. The organism probably attacks the ligament or the periosteum at the edges of the vertebra. The structures undergo the changes commonly seen in gonococcal infection namely fibrous thickening and at times calcification. If the periosteum is involved a true exostosis may be formed and the normal motion in the spine brings these exostoses in contact one with another or with some projecting bony prominence so that a deep-seated pain is produced. Let me recite a case of gonococcal infection involving both feet as well as the spine

CASE I—C C age 26 Admitted February 16 1905 Complaints of pains in both heels and pain in the back

Family History—Negative

Previous History—Three attacks of gonorrhœa the first ten years ago the second three years ago the third one year and three months ago. Associated with a posterior urethritis. With the second attack he had a suppurating inguinal bubo. No history of rheumatism typhoid fever or pneumonia.

Present Illness—Began one year ago that is three months after his attack of gonorrhœa. It began in both heels simul

taneously The pain and soreness have continued ever since, but with increasing severity Six months ago, while at Hot Springs for the pain in his feet, he was taken with a pain in his back This pain is present, whether he lies down or is walking about He walks with great difficulty

Physical Examination—Not a robust man Loss in weight during the past year has been fifteen pounds Right foot shows a decided thickening of the os calcis At the attachment of the plantar fascia with the os calcis there is a spot of acute tenderness on pressure This area measures about one centimeter There are no acute inflammatory symptoms Stretching of the plantar fascia causes the usual pain The big toe joint is slightly enlarged There is no pain on pressure about the tendo Achillis The left foot is similar in all respects to the right Spine painful to pressure along the entire lumbar region, but especially at the junction of the third and fourth vertebræ Lumbar lordosis is slightly diminished There is a slight bending of the body to the right Some pain is referred to the right sciatic region Hyperextension of the spine is impossible Bending to the left is restricted more than bending to the right

Operation—Incision along the outer border of the os calcis was made The exostosis was removed, and with it the tissue immediately adjacent The plantar fascia was adherent to the underlying adipose tissue in places

Radiograph—Small exostosis at attachment of flexor brevis digitorum to os calcis Slight thickening of os calcis Radiograph of the back shows two exostoses approaching one another between the third and fourth lumbar vertebræ (Figs 1 and 2)

Bacteriological Report—Cultures were negative Plantar fascia showed evidence of an acute inflammatory process, with round-cell infiltration and an increase in blood-vessels Sections stained for organisms show the presence of a biscuit-shaped coccus, which is the size and shape of the gonococcus

Result—Three months after the operation, patient reports that the pain in his heels has entirely disappeared He is still wearing a spinal support for the arthritis of the back He is attending to his business for the first time in more than a year

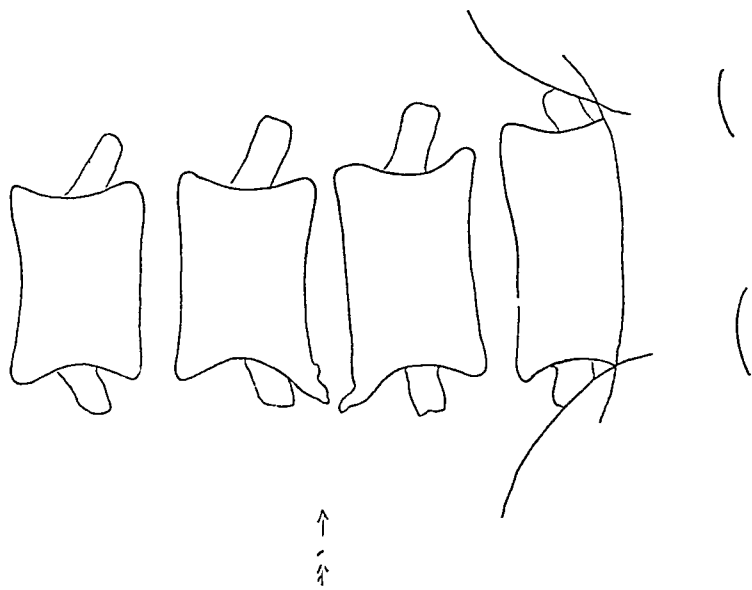
Here we have the production of an exostosis on the inferior surface of the os calcis, which when removed showed the

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FIG 2

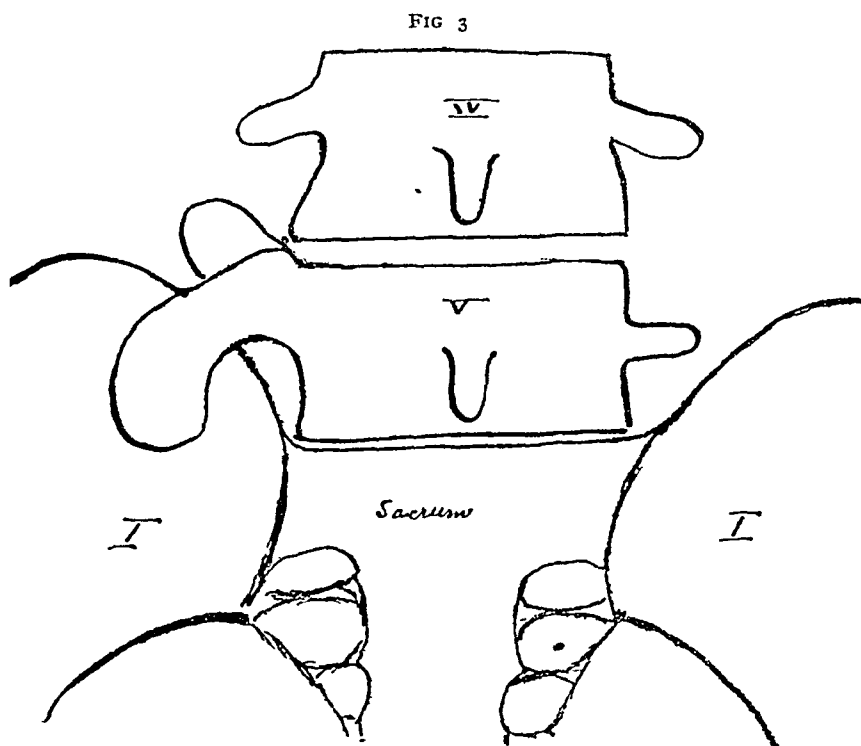


CASE 1—Gonorrheal exostoses of the spine

presence of the gonococcus in the tissue. The radiograph of the spine shows two prominent exostoses following the course of the lateral ligament. One springs from the inferior border of the third lumbar vertebra and the other from the superior border of the fourth lumbar vertebra. As the spine undergoes lateral bending it is easily seen how these two exostoses come in contact one with another and produce the pain complained of. As the gonococcus was the organism found in the exostosis of the heel and as the attack of pain in the back came on shortly following the trouble in the heel it is fair to assume that it was also the etiological factor of the exostosis in the spine. As long as the patient wears a light support which prevents lateral motion in the lumbar region he is perfectly comfortable. As soon as he discontinues its use the pain returns. The rational treatment would be to remove these exostoses in the spine but as the brace affords perfect relief the patient is loth to undergo further operative measures. Not only a gonococcus can cause such formations upon the spine but also other organisms as the tubercle bacillus and the typhoid bacillus and the cases of both of these infections resulting in changes in the contour of the spine have been reported.

Besides those cases known to be of infectious origin we have the cases of osteoarthritis of the spine. These cases are probably due to metabolic disturbances. They may involve a large area of the column or there may be some localized focus which one can usually remove. They are generally found in the lumbar or cervical region that is wherever a considerable degree of motion is allowed. Often these cases are associated with other constitutional disturbances as the presence of gall stones or of renal calculus. Unfortunately when the new bony deposits have been laid down they do not respond to medication as the two conditions just mentioned. I have brought up the subject to-day in order to show that whatever be the etiological factor in these cases whether congenital deformities anatomical variations traumatism infectious processes or metabolic changes the spinal column is a legitimate

field for operation in certain cases which can be definitely pointed out by means of the radiograph. No other treatment will produce satisfactory and permanent results. In this connection I should like to report two cases where operative treatment was instituted with perfect recovery of the patient. In the case which we will call No. 2 we have the presence of a rudimentary rib springing from the left side of the fifth lumbar vertebra. It passed down into the pelvis, was inti-



CASE II—X-ray tracing, showing extra rib from 5th lumbar vertebra

mately bound to the lumbar sacral cord and was the cause of a sciatica which had been so persistent and so severe that the girl had been practically an invalid for the past five years. This rudimentary rib was removed by operation and thereby the pressure on the nerve removed, and since that time she has been perfectly free from pain and goes about as any normal person. The history is as follows:

CASE II—E. B. white female age 22 referred to me by Dr Thayer on August 22 1906 and was admitted to the Johns Hopkins Hospital. She complained of sciatica.

Family History—Negative

Previous Illness—There were the usual diseases of childhood with no acute illness.

The Present Illness—Duration five years. There was gradual onset with excruciating pain referred along the course of the left sciatic nerve going down as far as the foot. The pain was so intense that she was confined to her bed for nine months. Later she was able to be about on crutches. There would be periods when the pain was less severe than at other times but it was always present to a marked degree. The pain became very much worse again seven months ago since which time she has been practically confined to her bed the least motion tending to aggravate the condition. All the usual remedies have been applied. The galvanic current has been used without effect. The leg has been packed in ice and also put in extension. Injections of chloroform have been made directly into the sciatic surfaces only to aggravate the trouble. Four years ago the uterus was suspended thinking that it might possibly be exerting some pressure on the nerve in question.

Physical Examination—She is rather a thin girl somewhat anæmic hæmoglobin being 79 per cent. There is no glandular enlargement. Heart and lungs negative. The abdomen is negative except for some soreness on pressure in the left side of the umbilical region. The patient lies in bed with the leg flexed at 45°. The knee jerks are slightly exaggerated. There is intense pain on pressure over the lower lumbar region on the left side and also over the sciatic nerve as it emerges beneath the gluteus muscle. The pain is elicited on pressure behind the trochanter as well as in the popliteal space. All motions of the leg are carefully guarded. As the patient cannot stand it is impossible to test the flexibility of the spine. There is an atrophy of the thigh of 2 cm. and 1 cm. of the calf.

The Radiograph Examination—This shows a rudimentary rib about one and three quarter inches in length springing from the left side of the fifth lumbar vertebra and going down into the pelvis. The rib is of unusual thickness. It articulates with the vertebra in a normal manner. The transverse process is seen pushed somewhat upward (Figs 3 and 4).

Operation—The anomaly just described having been pointed out by means of the radiograph and its exact location and dimensions thus being made out, it was decided to operate in order to see whether it did not press directly on the lumbar sacral cord, thus causing the symptoms of sciatica. A vertical incision was made through the skin and fascia along the outer portion of the left lower erector spinæ group. These muscles were retracted inwards, but in order to get a better exposure a slight transverse incision was made into them. The quadratus lumborum was then separated from the erector spinæ group and we came directly down upon the transverse process and the rudimentary rib. One's finger was then inserted under the muscle and the rudimentary rib could be palpated, running down into the pelvis. It appeared to be about $1\frac{1}{2}$ in or 2 in long. By probing with the finger within the pelvis the superior portion of the lumbar sacral plexus was found to be closely adherent to the rib along its anterior surface. This was gradually freed with the finger and the rib was excised. The wound was closed entirely, the muscles being sewn with catgut sutures, and the skin with subcutaneous silver wire. A plaster spica was applied. The patient was free from her severe pain almost immediately after the operation, but all of the tenderness did not disappear for three or four weeks. She was able to walk around on a crutch at the end of her third week, and could go about without any support in little more than a month. She is now able to do everything that a normal person can do, and is perfectly free from pain.

The next case, No. 3, is that of a man who had a large exostosis an inch and a half in length extending from the lower border of the third lumbar vertebra and impinging on the side of the fourth lumbar vertebra causing intense pain in the lumbar region.

CASE III—R. S., male, age 45, admitted to the hospital April, 1906, complains of pain in the lumbar region and radiating into the scrotum. Family history is negative. Previous history of usual children's diseases and gonorrhœa twenty years ago.

Present Illness—For the past three years he has had marked pain in the right lumbar region, pain referred down along the right side and also into the scrotum. For the past five months the

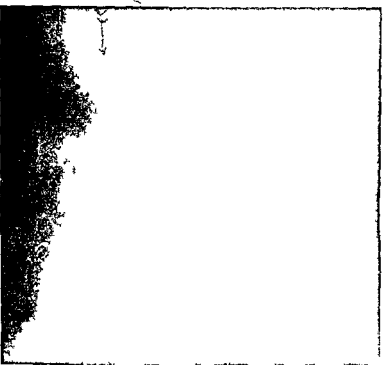
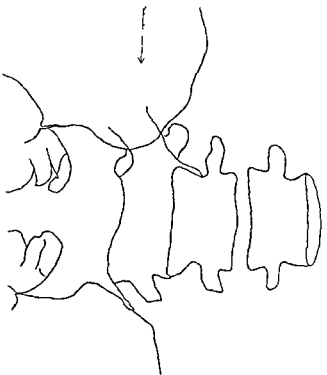
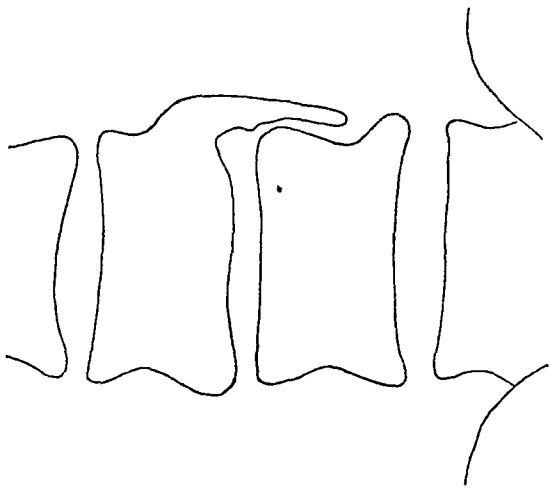
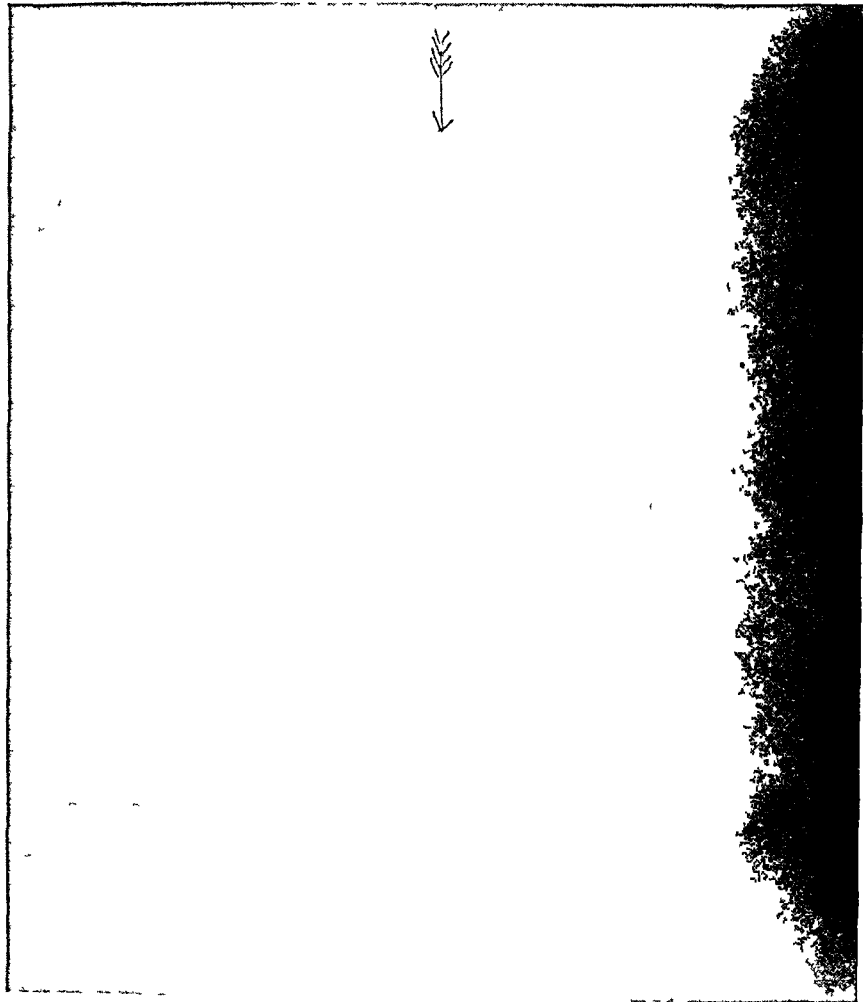


FIG 5



CASE III — Exostosis from the third lumbar vertebra

symptoms have been more acute all motion in the lower spine seeming to intensify them and at times the pain is so severe that he is weakened continually during the night

Physical Examination—At the local site of the disease pressure over the lumbar region causes intense pain. Motion of the spine especially in a lateral direction to the right or bending forward or backward is restricted as well as painful. Pain also radiates along the course of the sciatic nerve as far as the knee. The fingers of both hands show a mild grade of Heberden nodosities. Examination of the ureters shows both to be perfectly patent but some pus and casts were obtained from the right kidney.

The radiograph shows small calculus in the right kidney and a long finger like projection of bone about $1\frac{1}{2}$ inches in length extending along the lower margin of the third lumbar vertebra and passing down along the side of the fourth vertebra. It can easily be seen when one looks at the radiograph how motions are restricted especially as the patient bends toward the right side.

The operation was performed upon the right kidney and a small stone removed. There has been an improvement of the urinary condition and the pain in the scrotum has disappeared. The pain in the back and along the sciatic nerve continued to be so bad that on December 12, 1906, the patient returned for an operation for the removal of the exostosis. This was done by a vertical incision along the outer edge of the right erector spine muscle and a small transverse incision into those muscles to afford better exposure. The exostosis shown in the radiograph Fig. 5 was about an inch and a half in length and bound down to the fourth lumbar vertebra by dense adhesions. This exostosis was removed close up to its base. The wound was closed by sewing the muscles together with catgut and the skin with subcutaneous silver wire. Three weeks after the operation the patient was perfectly well and a letter from him yesterday said that he had had no pain since his operation.

From these three cases we are able to come to certain conclusions—in the first place that the spine is the seat of numerous affections which differ materially in their etiology.

That these affections simulate the symptoms of other diseases to such an extent that mistakes in diagnosis are fre-

quently made and the patients subjected to therapeutic remedies which cannot be of help to them

That in cases of persistent sciatica or pain along other nerves a radiograph of the spine should be made to determine whether there is not some point of bony pressure causing the trouble

That operations on the spine for the removal of these troubles can be made in many cases with perfect ease and safety

And that operation offers the quickest and most certain mode of treatment in a great majority of such afflictions

THE SURGERY OF THE THORACIC DUCT

BY HENRY P DE FOREST M D

OF NEW YORK CITY

S e c t h P h D partment

THE thoracic duct has from time to time been the seat of injury especially during operations on the neck and in some instances attempts have been made for its repair Such cases are of great surgical rarity and for this reason contribution to the surgery of the duct are of professional interest Rupture of the thoracic duct as an accompaniment of the gunshot wound of the lung has thus far been observed but once It is no wonder that such injuries are rare since the aorta lies in such close relationship to the duct that death usually occurs at once

A recent case may be found in the book of Graff and Hildebrandt upon Wounds Caused by Modern Firearms ¹ and is there described as follows

The projectile passed from a point in the region of the apex of the heart obliquely backward and to the right of the spinal column Probably the wall of the duct was contused and necrosed since the first symptoms of leakage developed only after a few days The diagnosis was then made because of the chylothorax which developed Several aspirations of the pleural cavity were necessary and the patient finally recovered Collateral branches evidently became functionally active while the main duct which was injured closed The chyle ultimately reached the blood current through the newly dilated channel

A case in which the thoracic duct was injured during an operation upon the neck was reported by the writer in his

Die Verwundungen durch die modernen Kriegsfeuerwaffen by Drs Graff and Hildebrandt Berlin 1907

Dietze Ueber Chylothorax traumaticus Deutsche Zeitschrift für Chirurgie vol 73 p 450

recent article upon "A New Disease of the Thoracic Duct"³ This was contributed by Dr L W Pearson of Brooklyn, and may be summarized as follows

Mrs E K., 45 years of age, suffered from enlarged cervical glands which had existed for about a year They were most pronounced upon the right side of the neck and the mass extended nearly to the level of the clavicle An operation was performed April 8, 1905, and the enlarged glands were removed One gland which had suppurated and the fistulous tract leading to it, were also dissected away, the dissection extending to about an inch above the clavicle Hemostasis was effected, and the wound was closed The patient recovered from the anæsthetic and did well On the fourth day she had one degree of temperature On this day the dressings were removed There was no suppuration, but the tissues near the suture line had melted away

Two days later there was edema of the parts along the line of the incision and adjacent thereto A probe was inserted at the lower point of the incision and a thick, curdy material began to pour out As the wound was held wider open, about a pint of this material was evacuated The wound was irrigated and cleaned, and then it was found that from the lower part of the wound, chyle welled up This was removed as fast as it was sponged away, and for the next five days, large quantities of chyle escaped more or less continuously The dressings were saturated and needed frequent changing Notwithstanding this loss of the products of digestion, there was no especial sense of hunger expressed by the patient, through she was growing somewhat weaker The temperature varied from 100° to 100.5° and the tissues melted away At no time was pus present.

On the eleventh day when the dressings were removed for inspection, the flow of chyle seemed to have diminished The wound was tightly packed with iodoform gauze with hope of its closing On the next day, the flow of chyle was very slight, on the following day no chyle appeared The wound itself rapidly closed in from this time forward, and convalescence was uneventful

By far the most valuable contribution to this subject, however, is the one recently found in the "Festschrift" in honor of the seventieth birthday of Prof Ernst von Bergmann, and was prepared by Dr Fritz Lotsch⁴ It is as follows

"A wound of the ductus thoracicus at a point near its outlet is an always rare complication of operations upon the left side of the neck"

³ New York State Journal of Medicine, July, 1907

⁴ Ein Beitrag zur Chirurgie des Ductus thoracicus, by Fritz Lotsch, Surgeon 30th Regiment, Madgeburg Fusiliers, Berlin, 1906

The first observation recorded upon this subject was made by von Boegehold in the year 1883. He writes

Strangely enough with the exception of the case observed by me I have never seen a reference to wounds of the thoracic duct in the neck although with the extirpation of large tumor in this region such an accident can easily happen

Since that time current literature upon this subject has slowly increased from year to year. Unterberger⁵ collected at the end of the year 1905 all of the cases in the Königsberg Surgical Clinic of operative wounds of the thoracic duct which had occurred and found them to be thirty in number

Certainly not all cases have been recorded for instance in the atlas of Bockenheimer and Frohse it is stated. In spite of all care it will some time occur in the sawing through of the clavicle that the thoracic duct is wounded. It is not necessary to suture it since a tamponade will as a rule remedy the injury

It is certain however that the wound of the duct considering the vast amount of material reported is not an every day occurrence. The case reported by Dr. Lotsch is as follows

Mrs. Clara H. aged 30 years recurrent sarcoma of thyroid gland. Partial resection of gland at primary operation April 1904. Secondary operation April 1905.

Transverse incision of the old scar. Extirpation of the individual tumor masses. The left internal jugular vein was ligated.

During the dissection of the nodules in the left upper clavicular fossa the deeper portion of the wound suddenly filled with turbid milky fluid which welled up instantly as soon as it was sponged away. The duct the size of a straw was exposed and a cut in following one third of its circumference was visible. The incision was closed with three fine catgut sutures. The chyloorrhea ceased. During further dissection the bulb of the left common jugular vein was exposed and was accidentally torn open. The severe hemorrhage which occurred through this slit like wound was controlled by suture of the wall of the vessel. The tumor was finally removed upon both sides each mass the size of a pigeon's egg. Both surgical triangles of the neck from the angle of the jaw to the aperture

of the thorax, were dissected as free as in an anatomical preparation Gauze drainage Suture of the wound

April 13 Temperature continues normal A marked edema of the left side of the face had developed Otherwise the patient was in excellent condition The wound healed per primam In the drainage opening fresh granulation tissues appeared The wound being nearly healed, she was permitted to go home

March, 1907, one year after the second operation, the patient was found to be entirely free from recurrent growth and in excellent health (This ends the case history)

This case had to do, therefore, with an oblique wound of the thoracic duct in the supra-clavicular fossa occurring during the extirpation of a firmly adherent secondary nodule of sarcoma

The severe chyloorrhea was controlled by catgut sutures of the wounded duct.

At the present time the therapy of wounds of the thoracic duct has not a firm basis chiefly because of anatomical variations and partly also for physiological reasons At least from a practical surgical point of view the rules thus far laid down are uncertain

Even to-day, the conclusions reached by Tholes (1901) are still accepted "Our knowledge of the exact anatomical relations is still defective and needs the added experience of numerous investigations, such as are given in the works of Boegehold and Wendel Perhaps it will develop that many conditions now regarded as variations, will prove the normal condition and are the natural safeguards of the body against an occasional wound of such an important structure"

The real question to be considered, therefore, is, Is it possible to ligate with safety the wounded trunk of the thoracic duct in man?

The thoracic duct conveys, as is well known, the finished products of digestion, the chyle, into the blood current and in addition collects the lymph of the entire body, with the exception of the right upper half of the body, whose lymph channels ultimately fuse in the ductus lymphaticus dexter The current of the chyle is controlled by the movements of respiration With each inspiration there occurs a temporary negative pressure within the thorax, which sucks the chyle from the

abdominal cavity. Some observers have occasionally discovered that the chyle has a rhythmic motion synchronous with each inspiration very similar to the pulse. (Keen Cushing Schroeder Plummer Lecene.)

Concerning the course and topography of the extra thoracic portion of the thoracic duct the following is a short resume

The ductus thoracicus passes on the left side of the œsophagus in the cephalic aperture of the thorax. At the level of the sixth vertebra it turns sometimes in an acute sometimes in an oblique curve upward and forward and terminates in the angle of junction of the left sub-clavian vein with the jugular vein where both of these vessels unite to form the vena anonyma sinistra. Shortly before its termination it receives the lymph duct coming from the left side of the head and neck (truncus jugularis sinistra) as well as that of the left arm (truncus sub-clavius sinistra) finally also the truncus lymphaticus mammarius sinistra.

At the mouth of the duct in the wall of the vein there are two valves which prevent the flow of blood back into the lymph channel.

It is well recognized how variable and inconstant the course of even the large lymph vessel is and attention has often been called to the frequent inconstancy in position of veins, arteries and lymph vessels. These variations occur also in the ultimate termination of the great lymph channels the thoracic duct.

In the present instance we are concerned chiefly with the anomalies in the region of the mouth of the duct. It is important for surgeons to know that the thoracic duct occasionally terminates upon the right side and that upon the left side in such cases the duct conveys only the lymph from the left upper quadrant of the body into the blood current. Whether these anomalies habitually occur with situs viscerum inversus has not yet been determined. Very often anomalies of the blood vessels are present in the same individual.

Of primary importance for the surgeon in treatment of

the wounds of the duct, is the position which the terminal opening occupies in the vein, whether it is in the re-entrant angle or in the jugular or in the sub-clavian vein alone. All possible combinations may occur which can be theoretically imagined. The jugular, sub-clavian and the mammarius veins sometimes have the duct lying close along the wall of the vein sometimes the ducts of which there may be several are separate and enter the blood current in two or three places. Several anastomoses can sometimes be determined. Not infrequently the duct, after it is joined by the already mentioned lymph channels, divides into a larger or smaller number of fine vessels, sometimes short and sometimes long, which separate or anastomose in several places before they finally enter the wall of the vein. This delta formation is probably the reason why so many variations have been observed. As a rule it is probable when the main channel fills that most of the chyle will pass through it and the smaller ones become so attenuated from inactivity that they escape observation.

In a similar manner may be explained those anomalous lymph channels which have been observed and described in connection with the lymphatic glands of the breast, as they course along the wall of the thorax or of the abdomen. Wutzer, Wendel and Arnold have described communications with the vena azygos, Wendel has observed one with the vena renalis.

When one considers what an important rôle the thoracic duct plays in the function of the entire body, it is little wonder that numerous collateral branches exist to provide against emergencies.

A great many investigators have sought through experiments upon animals to answer the question as to the result in case the thoracic duct was completely occluded. Most of these investigations have been conducted upon dogs. The result in the greater number of cases was merely a temporary impairment of nutrition.

On the other hand, if the duct is cut through without ligating it, there occurs at once the symptoms of a profuse

chylorrhea which if it be not checked either by accident or by design will in a short time lead to progressive loss of strength and finally to death

In the wounds of the duct which have occurred during operations this chylorrhea strangely enough often does not develop for some hours and often even days after the lesion has taken place (Thole Schopf Phelps Vagedes Ricard Wendel and Halsted) Probably in these cases there was a narrow slit in the wall of the duct which was temporarily closed by a small clot of blood or something of that sort

The tremendous amount of chyle which can escape through the duct which has been opened by accident has been shown in some operative cases in which efforts to check the chylorrhea did not succeed (Schwinn Schroeder Plummer Schopf Ricard and Thole whose patient was literally deluged in chyle)

Especially characteristic in this connection is the case reported by Hahns in which as a result of an intra thoracic rupture of the duct nearly 30 litres of chyle were withdrawn by aspiration

The disease picture which develops as a result of chylorrhea has been observed and described several times (Wendel Schwinn Schroeder Plummer Schopf Ricard Thole) The digestive organs work in vain Hunger and appalling thirst develop Ingestion of food is followed by a marked increase in the chyle which forms and escapes Emaciation and progressive loss of strength weakness of the heart action and finally loss of consciousness follow as a result of such a condition Whether the fever which has been occasionally observed is due to absorption of nucleins and albumins is not certain

Death notwithstanding all this is rather uncommon The chyle possesses a certain ability to coagulate yet as a rule sooner or later the stream of chyle reaches the general circulation through other newly dilated channels

In many cases after tamponade of the wounded duct the patient complains of a pressure in the thorax When the bandage is loosened in such cases profuse chylorrhea is observed

More frequently in the first few days after the accident, circumscribed edema occurs in the certain areas. Unterberger describes edema of the left arm, in our own case an edema of the left side of the face was observed which was increased after the ligation of the jugular vein. All these observations seem to indicate that a certain time is needed to establish collateral circulation and to give these non-functionating vessels a chance to dilate. It has never happened, however, that the pressure in the duct in any case is so greatly increased that a rupture of the duct or of one of its radicles has occurred.

The disturbances of circulation which have occurred after operative wounds of the duct have taken place, are as a rule not excessive,—since the pressure of the tumor masses or of the large abscess cavities has already caused a certain development of the collateral branches before the operation takes place.

In the 31 cases observed, 15 were operated on because of malignant tumors (usually metastatic), and 13 because of tubercular adenites. In two (Cheever and Schroeder-Plummer) the character of the tumor is not stated, and in one case (Ferguson) an aneurism of the left sub-clavian artery existed.

In all of these cases there existed conditions which might give rise to marked pressure upon the duct, and therefore it is not possible to exclude the possibility of a more or less collateral circulation. Some observers have described the escape of the chyle in a rather thick stream (Boegehold and Lotsch) of the size of a straw, Schwinn speaks of the size of a knitting needle. Lecène gives a lumen of from 1 to 3 mm.

Two cases of death have occurred in the 31 cases reported in which the thoracic duct has been wounded during the operation (Cheever, Schopf). Lotsch does not agree with most of the writers that one is therefore justified in regarding this as the cause of death. The patient of Cheever died thirty-six hours after a very severe operation as the result of shock. The chylothorax was checked by a firm tamponade.

The patient of Schopf died 16 days after the operation. Autopsy showed an excessive chylothorax on both sides, with a

fibrous pleurisy and pericarditis on the left side so that death cannot properly be ascribed to the wound of the duct alone

It therefore follows that the prognosis in wounds of the duct is by no means so bad as it appears to be at first sight. Efforts made to check the chylorrhea in some way or another have nearly always succeeded. In the more unfavorable cases a pronounced loss of strength developed from which the patient recovered after a long convalescence.

In view of our present knowledge of this subject are we justified in treating the wound of the duct precisely as we treat those of blood vessels. Several methods are to be considered in this connection

1 Ligature 2 Suture 3 Suture of the enclosing tissues 4 Application of an artery clamp 5 Compression by firm tamponade

The implantation in the vein of a duct which has been cut across (Schopf) is scarcely possible on technical grounds and has completely failed in satisfactory results.

Of the various methods which have been attempted the one should be given the preference which with certainty will check the chylorrhea at once. All plans are not of equal value. Ligation or suture upon the one side and tamponade upon the other may be compared with each other. Formerly most operators preferred tamponade but in more recent years nearly all authorities have recommended ligation. In most cases tamponade has failed to check the chylorrhea immediately. Ligation and suture when properly applied at the place of the injury must of necessity check the flow of chyle. They are therefore the methods to be preferred.

One drawback however exists—a technical one. It is often impossible at the bottom of a funnel shaped wound to see the exact site of the injury and to grasp the duct. The nearness of the pleural cavity and of the large blood vessels of the neck adds a considerable risk and it is with great difficulty that the duct can be grasped for the proper application of a suitable clamp. In such cases of necessity the tamponade may be used when other methods cannot be applied without great

additional danger Actual suture at the site of the injury on the wall of the duct, occupies a peculiar place In many cases occurring during the operation, the surgeon has to deal not with the total division of the duct, but rather with a slit-like opening caused by the firmly attached portions of tumor breaking the wall of the duct during their removal If it be possible to bring this slit clearly in view, then a suture is technically possible, and the result must be a most satisfactory one

The wound does not close spontaneously, since the chyle has little tendency to form a clot, and the pressure from within is great enough to keep the wound open It therefore follows that a suture can be used only in a limited number of cases, and in any case, is not technically easy It is however to be attempted in this special class of cases, since it is the only means of controlling the leakage from the duct

In the 30 reported cases, ligature was used 9 times, 6 times with an immediate result In 2 cases the result was attained only after a certain time (Weischer 8 days, Unterberger 18 days, Schroeder-Plummer (2), Lesniowski (2), Brohl, Thole, Receni and v Graff) The case of Ferguson is not included, since the attempts at suture failed Schroeder-Plummer had to report a complete lack of success in his first case The ligature was applied when the clamp was removed and immediately the chylorrhea recommenced, a certain indication that the ligature was not properly applied Tamponade for three months led to a progressive cessation of the chylorrhea This mischance was not due to the fault in the method, but rather to the imperfect technique

Suture of the tissue (Umstechung) was used in two cases of Wendel and von Schopf, and both cases were successes In Wendel's case neither tamponade nor clamps nor repeated tissue suture succeeded in checking the chylorrhea Suture gave only temporary benefit Finally the use of a firm tamponade held in place for five weeks Clamps applied for a considerable time were used in this case

Phelps and Schwimm could not ligate the duct because of the depth of the wound A clamp was applied and left in

place for three days this succeeded in terminating the chylorrhœa. In Wendel's case two clamps were applied. Chylorrhœa ceased on the fourth day. In three cases the method failed and tamponade was then applied.

In 13 cases a tamponade was used. In 6 the flow was controlled at once. In Ricard's case the wound was dressed upon the sixth day and then for the first time a collection of milky fluid was observed. This is very similar to the case of Pearson. This was first thought to be pus and only after 14 days was a tamponade applied. In the remaining cases chylorrhœa ceased after a variable time (from five days to five weeks). Both cases which died (Cheever and Schopf v s) were treated by means of tamponade.

CONCLUSIONS

1 The thoracic duct probably has collateral branches always which are able in case of accident to perform the function of the main duct. Further anatomical investigations concerning this are greatly to be desired.

2 The sudden closure of the duct in man has had as its result only transitory disturbance in the nutrition of the body.

3 Chylorrhœa occurring after a wound of the duct must if possible be immediately controlled.

4 The wounded thoracic duct may be treated precisely as we would treat a wounded blood vessel.

5 Suture is the ideal method. If it is technically possible its use is to be preferred since the duct then remains patent.

6 In all cases in which suture can be performed a ligature should be applied. If ligature is technically impossible then in order of value suture of the tissue (*Umstechung*) application of clamps and in emergency as a last resort tamponading should be applied.

NOTE *Bibliography*—A complete bibliography of the subject will be found appended to the memoirs of *v. Graff* *Zur Therapie der operativen Verletzungen des Ductus thoracicus* *Weiner klin. Wochenschr.* 1905 Nr 1 and *Unterberger* *Ueber operative Verletzungen des Ductus thoracicus* *Beiträge zur klin. Chirurgie* Bd 47 Heft 3.

DERMOID CYST OF THE HEAD

EXCISION, USING CRILE'S TEMPORARY CLAMP ON THE COMMON CAROTID

BY J SHELTON HORSLEY, M D,

OF RICHMOND, VIRGINIA

Professor of Principles of Surgery and Clinical Surgery in the Medical College of Virginia
Surgeon to Memorial Hospital

THE situation of dermoid tumors usually follows certain definite lines, as Mr Bland-Sutton has pointed out. The vast majority of these growths are found either in the abdomen, especially in connection with the ovary, or else about the embryonic fissures. Those fissures which, when closing, separate a mucous from a cutaneous surface, are especially prone to be the seat of dermoids. Thus, it is not uncommon to find them about the coccyx, where the posterior fissure closes, and about the eyes, springing from the orbito-nasal fissure. The lower part of the nose, the middle of the upper lip, and the outer angles of the mouth are regions where dermoids of the face arise because of the previous existence of fissures at these points. The floor of the mouth, resulting from the closure of the intermandibular fissure, is not an infrequent region for these cysts, and here they are often confused with retention cysts. The resemblance of these two classes of cysts is all the more confusing when the dermoid is derived from the implantation of an early matrix before the more complex epithelial elements have formed. In such instances, the contents may be of a mucous character, resulting from the degeneration of the lining epithelium of the dermoid, and consequently be almost identical with the contents of retention cysts found in this neighborhood. If, however, the matrix from which the dermoid arises is of a later stage of development when such structures as hair or teeth may arise from it, the differential diagnosis is clear. Dermoids in the neck are usually derived from inclusion of a matrix from the branchial clefts.

It has been generally believed that the ovary is the most

FIG 1



Dermoid cyst of head Photograph taken a few days before operation

frequent site of dermoid cysts. This is due to the fact that such tumors of the ovary often attain large size and consequently are reported more frequently than the smaller and more insignificant dermoids in other regions of the body. Then too the dermoid of the ovary often contains other elements than those of epithelial origin which makes the tumor of a more sensational character and therefore more likely to be reported. For instance cartilage and bone showing a mixed matrix are often found whereas dermoids of the subcutaneous areas are almost always of a pure epithelial origin.

The following case is reported because the dermoid was in an unusual location apparently springing from the temporal fossa and because it is an exceptionally large one for this region. Senn says that with the exception of the ovary

dermoid tumors larger than a hen's egg are rare. From an operative standpoint some interest may attach to the effect of temporarily clamping the common carotid—a method recommended by Crile. The absence of injury to the artery is shown quite clearly in the specimen which consists of the common carotid and the first portions of the internal and external carotids.

The patient was a negro man forty years of age of a rather low degree of intelligence. His previous history was vague but from what could be gathered he seemed to be in good health until two years before admission to the hospital though he had never been very robust. About two years before the present operation the left side of his lower jaw was fractured as the result of an accident. This was followed by some tumor formation as well as I can gather from his history and as a result the left portion of his lower jaw was excised by another surgeon. Soon after this operation he noticed a growth beginning on the left side of his face apparently involving the upper jaw. Later the tumor grew more rapidly and became quite painful the pain being due apparently to pressure upon branches of the fifth nerve. His appearance on admission to the hospital January 2 1907 is well represented by the accompanying photograph (Fig. 1). There was no paralysis of the seventh nerve and no paralysis of sensation. Certain portions of the tumor presented a bony consistency

and over other portions distinct fluctuation could be obtained. The hard area of the tumor corresponded to about the region of the malar bone, and was later shown to be due to the fact that this bone and the adjacent portions of other bones were attached to the wall of the cyst and had been pushed forward and outward by the growth of the tumor. The part that showed fluctuation was where the cyst wall was covered merely by skin and subcutaneous soft tissue. The patient was considerably reduced in strength and weight, and suffered neuralgic pains from pressure almost constantly. On admission his pulse was 80, temperature 98.4, respirations 18, urine normal. He had considerable difficulty in chewing owing to the previous removal of part of his lower jaw, and also because of the tumor. He was given tonics and soft diet and every effort was made to build him up. The nose and throat were sprayed with an antiseptic solution several times a day and the mouth cleaned after feedings.

On January 8, 1907, I operated upon him at the clinic under ether narcosis. A hypodermic of morphine and atropine was given before the anæsthetic was started. An incision over the anterior lower portion of the sternomastoid muscle exposed the common carotid, which was clamped with Crile's clamp, both blades of which had been covered with rubber tubing. The skin over the most prominent area of the growth appeared moderately adherent, so the incisions were fashioned in such a manner as to leave this part of the skin attached to the tumor, as it was thought at the time that the tumor was a sarcoma. A long incision, starting behind and above the outer angle of the orbit, swept down somewhat posterior to the most prominent portion of the tumor, and curved forward underneath the jaw. Another incision, connecting the horizontal and vertical portions of the first cut, left an island of skin over the most prominent part. The upper part of the tumor was then exposed, and the outer wall of the orbit cut through with bone forceps. The lower wall of the orbit, the superior maxilla near the alveolar process, and the zygoma near the temporal bone were similarly cut and the lower and outer portion of the wall of the orbit, including all of the malar and part of the superior maxilla, was removed with the growth. By dissecting from above downward and keeping as far from the capsule of the tumor as possible it was excised intact. Particular care was taken to avoid rupturing the cyst. As the

FIG 2



The interior of the common and internal carotid arteries. The Crite clamp had been applied about point 'A'. Note entire absence of injury to the intima. The few shreds of fibrin, found in all large arteries after death, have not been removed.

FIG 3



Lateral view, showing the external carotid, which has been split to the ligature, still containing part of a clot.

patient had been placed with his body and head in a semi sitting position but little blood was lost from oozing and the temporary clamp on the common carotid controlled arterial bleeding perfectly. Not more than an ounce and a half of blood was lost at the operation. When the growth was removed the external carotid was ligated near its origin as on account of the bony surfaces left it would not have been practicable to control the terminal vessels from this artery by ligatures. The clamp was removed from the common carotid and the wound sutured. The patient suffered somewhat from shock but an hour after returning from the operating room his temperature was 98.3 pulse 100. His condition the following day was satisfactory except that deglutition was rendered painful and more difficult by reason of the extensive operation. Anticipating the possibility of pneumonia a pneumonia jacket was applied and the nose and mouth frequently sprayed with antiseptic solutions. During the first forty eight hours after operation he vomited a few times. On January 10th his temperature reached 101 the highest point up to that time since the operation. His pulse was 120 and respirations 32. Examination showed beginning pneumonia and the patient was referred to Dr. M. Call Professor of Medicine in the Medical College of Virginia. The respirations and pulse increased in rapidity until a few hours before his death when the pulse was 162 and respirations 52 with a temperature of 102. He died about nine P. M. on January 14th.

The post mortem held by Dr. Call a few hours after death showed consolidation of practically all of the lower lobe of his right lung and portions of the upper and middle lobes. There were old pleuritic adhesions on the right side. Death was due to pneumonia. The wound was in excellent condition and had healed by first intention throughout most of its extent. There was no suppuration at any point. Most of the trunk of the common carotid with portions of the internal and external carotid arteries was removed in one specimen. The common carotid showed no injury at the point where the clamp had been applied (Fig. 2). The lumen of the internal carotid was free as was also that of the external carotid up to the ligature. On the distal side of the ligature a clot filled the lumen of the external carotid for about half an inch. The condition of the arteries is shown in the accompanying photographs (Figs. 3 and 4).

I am greatly indebted to Dr Joseph Bloodgood, of Baltimore, for the following report

" March 10, 1907

"*Pathology* P No 8007, *Gross*—The specimen consists of a cystic tumor of the peculiar shape shown in the photographs (Figs 5 and 6) It measures about 6 inches in length by 3 inches by 4 inches Over one side there is an elliptical piece of skin 4 inches by $1\frac{3}{4}$ inches On another side is a flat piece of bone $2\frac{1}{2}$ inches by $2\frac{1}{2}$ inches in surface diameters The bone, however, is exposed in only one area, which suggests the inferior orbital ridge of the superior maxillary bone The remainder of the bone is covered with muscle, subcutaneous tissue and fat, as if it represented the anterior wall of the antrum Attached to the cyst wall are pieces of fat, muscle and connective tissue The cyst wall can be stripped from the piece of bone and leaves it denuded of its periosteum On opening the cyst, it contained a thick, brown fluid, quite granular and of the appearance of contents of a dermoid into which there has been some hemorrhage When this contents is washed out, in one or two places the granular masses of the contents stick to the smooth cyst wall within The wall in some places is gray in color, in others stained brown with blood It looks like epithelium-lined tissue On section it is composed of a dense membrane not more than 1 mm in thickness Beyond this membrane in some places there is no other tissue, it is adherent to the bone over the piece described, while in the remainder there is muscle beyond

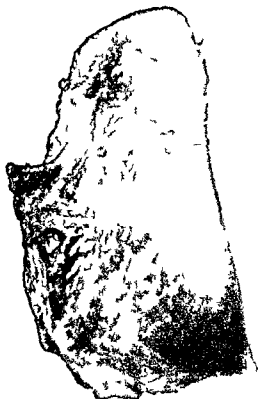
"Path No 8007 Microscopic study

"Section 2 Thin cyst wall Section shows fibrous connective tissue in lamellæ On the cyst side the connective tissue is much more compact and on the surface in the first layer of connective tissue there are numerous spindle nuclei suggesting the basement membrane beneath an epithelial lined surface but no epithelium is to be seen Beneath this there is some pigment In the wall further from the surface there are numerous round and spindle nuclei in the fibrous connective tissue and here and there small areas of lymphoid cells Deeper there is the remains of a striated muscle undergoing pressure atrophy There are very few blood vessels and no giant cells We have the usual picture of connective tissue wall of the cyst, but the epithelial lining quite often found in the dermoid is not present Here and there are large vessels filled with blood cut both longitudinally and across As the cellular areas are most marked where we find remains of muscle they suggest the indication of an interstitial myositis from pressure The round, spindle and lymphoid cells are found also in the region of vessels

"Section 1 The thicker portion of the wall including muscle We have the same picture seen in section 2, but no epithelial lining Beyond this muscle it is almost completely replaced by fibrous tissue, with here and there a blood vessel surrounded by lymphoid cells"

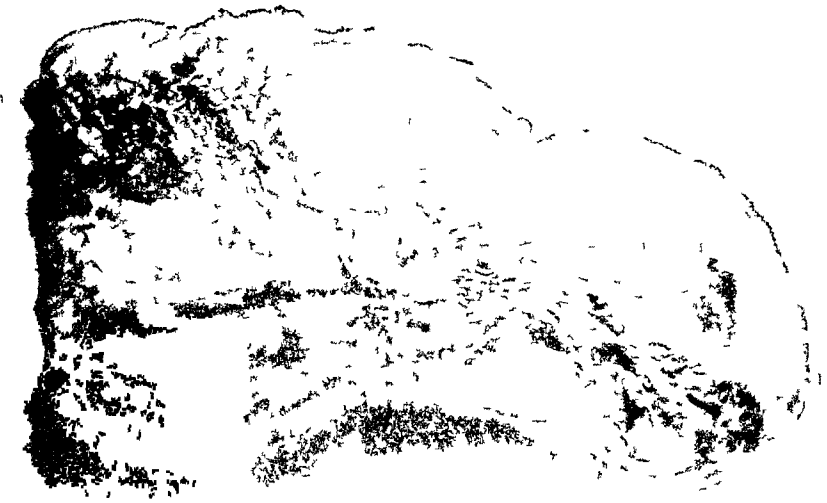


L t l h g l g a t h t m l e a t d



A t e r r f l h t m N e a t h b o y e n d p o r t f t h i l d f k l l
t h d t h m e a t h p p a r t l t h b o y w n l t h b

FIG 6



Internal surface of the tumor

STYLO HYOID OSSIFICATION

BY THOMAS DWIGHT M.D.

OF BOSTON MASSACHUSETTS

P km P fesso I A t my tth H rv dM d IS hool

Observavi tamen aliquando processum styloideum usque ad cornua ossis hyoides pervenire ipsisque valido nexu juncti de Marchettis Anatomia Patavii 1652 cap xiii p 203 Probably the earliest reference to this condition

Although the occasional recurrence of ossification of the second branchial bar represented by the styloid process the stylo-hyoid ligament and the lesser horn of the hyoid has been repeatedly observed in man yet the number of well described cases is very small Le Double in his work on the variations of the facial bones finds only some twenty instances of which one or two have never been published and of which others are very inaccessible This condition has most frequently been recognized in the living by laryngologists but it may be said that its clinical importance has not been generally appreciated It appears moreover that there is even among anatomists more or less misunderstanding as to what has actually occurred in these cases and that the nomenclature of the parts involved is very confusing

This subject has been particularly brought to my attention by the observation of a very perfect case of ossification of practically the whole chain on both sides in a dissecting room subject Moreover the peculiarity was discovered before the dissection was very far advanced so that it was possible to have the body X rayed before the relations which existed in life had been very seriously changed At almost the same time two extremely long styloid processes reaching nearly to the hyoid were observed on another subject which was also X rayed So far as I am aware these skiagraphs are the first that have been made of this condition

In this paper I propose (I) to describe the composition

of the stylo-hyoid chain and to show what occurs in ossification of the chain or of parts of it, (II) to describe cases of extensive ossification of my own observation, and others in the Warren Museum of the Harvard Medical School, and then to mention the peculiarities of a number of other specimens found in literature, and (III) to refer to the clinical importance of this condition

I

The Stylo-hyoid Chain—The second branchial bar or the cartilage of Reichert, extends in early embryonic life downwards and forwards from the skull to meet its fellow to which it is connected by a cross piece the *basi-hyal* which becomes the body of the hyoid. The chain of pieces with which we have to deal does not include the *basi-hyal*. It consists of four elements. (1) The *tympano-hyal* extending from beside the petrotic capsule, which later is enclosed in the petrous portion of the temporal bone, to the lower surface of that bone or a little beyond it. The late Professor Flower was, we believe, the first to suggest the name we have used for this element. French writers call it *le prolongement hyoidien*. (2) The *stylo-hyal*, which usually forms the greater part of the styloid process. (3) The *cerato-hyal* which is usually represented in the adult by the stylo-hyoid ligament, or by an ossification in the same, and (4) The *hypo-hyal* which becomes the lesser horn of the hyoid. There is unfortunately more or less confusion in the nomenclature. Some writers call the *cerato-hyal* the lesser horn and some use the term *epi-hyal*, which we have avoided altogether, for diverse elements. Some parts of this cartilaginous chain become bone by the normal process of ossification, but other parts degenerate into fibrous tissue. Before considering the remarkable cases of extraordinary ossification, something should be said of the usual course of events and of minor modifications.

Let us examine very briefly these different parts of the stylo-hyoid chain in a little more detail. First what constitutes the normal styloid process? There is a very confusing

discrepancy of opinions The soundest view is that according to which it consists of the tympano-hyal and the stylo-hyal Normally the tympano-hyal projects but very slightly beyond the temporal and shows a rough circular end which is connected with the next piece by cartilage or perhaps by fibrous tissue during adolescence and sometimes for a much longer period Ultimately it fuses with the styloid which is thus joined to the skull Yet I have seen a skull said in the catalogue to be of a child of eight but which I should call some four years older with the tympano hyal projecting a centimetre or more from the base and joined to a second piece by a jagged line of union In several of the anomalies to be described later the tympano hyal projects considerably

Sappey following in the main Geoffroy Saint Hilaire who was the first of modern authors to write on the hyoid chain makes the styloid process consist of the first and second pieces but he adds that the cerato-hyal ossifies before the stylo hyal In his diagram of what is normal he figures a free ossification in the cerato-hyal He believes that this fuses with the tympano hyal and the other where it fuses with the cerato-hyal The theory that the fusion of the cerato-hyal with the stylo-hyal forms the tip of the styloid is very hard to determine but it is a plausible explanation of instances when the point of the styloid especially of a long styloid joins the shaft at an angle

Sappey seems to be alone in supposing that the cerato hyal ossifies before the stylo hyal For our part we believe that it is quite exceptional for the cerato-hyal to ossify at all although sometimes it presents a long slender ossification It is possible enough that the upper end of this may join the styloid but we do not believe that this is the usual process The lower end of this ossification may join the hypo hyal thus making a very long lesser horn Finally the normal ligament may be absent altogether the original cartilage having disappeared and left no trace

The hypo hyal or lesser horn normally persists as an elongated cartilaginous nodule which is connected to the hyoid

by a ligament or by a true joint, and which late in life may be joined to it by bone. Sometimes, indeed, this bony union occurs very soon. The usually small nodule may be long and even double. It may fuse with the cerato-hyal. On the other hand it may be represented by fibres forming the lower part of the stylo-hyoid ligament, in which case the lesser horn is said to be wanting, and finally as in the cases just referred to, there may be not even a ligament. Thus it appears that the process of development presents a great number of individual variations and moreover that the same, or at least a similar, result may be reached by different processes. Thus the styloid need not always be composed of the same pieces, and the lesser horns may be elongated either by uncommonly large hypo-hyals or by their fusion with an ossification in the cerato-hyal.

A most important point in the consideration of cases of almost total ossification of the chain is that this is not to be considered a degenerative change, depending on age. That this idea was formerly held can be shown by quotations from eminent anatomists. Thus Gruber wrote "Should the stylo-hyoid ligament become ossified throughout its length and also in rare cases among old people become joined with the styloid process, then the last will reach from the skull to the hyoid as was first observed by de Marchettis and after him by others and myself." Sappey alludes to the ossified cerato-hyals joining the styloids at from fifty to sixty and adds that the styloid process then takes on what he calls a "monumental" appearance twisted and knobbed, which characterizes it in some individuals. Though we believe the joining at that age to be entirely imaginary we quote the passage as showing the existence of the idea that these things come with advancing years.

Debierre, I believe, was the first to protest against this view. He writes, "Mais il ne faut point dire, avec nombre d'anatomistes, que dans certains cas le ligament stylo-hyoidien s'ossifie. Ce n'est pas ainsi que se rétablit la chaîne hyoïdienne osseuse." Peter who studied a large series of hyoids says

of the instances of remarkably long lesser horns that five of the most striking cases occurred in persons of from four teen to twenty five years Le Double insists that it is to be considered a theromorphuc manifestation

The facts are these It is perfectly true that in certain cases cartilaginous and fibrous tissues degenerate by the de posit of earthy salts into what may be called bone Although most likely to occur in old age yet it not rarely occurs early and is apparently to be attributed to constitutional causes

In point of fact these cases are due chiefly (if not in all details) to the persistence of the embryological cartilage to its growth to an abnormal size and to its final conversion into bone This last is not a degeneration of tissue but the normal process as it occurs among animals in general This is made very striking in most of these cases by the large size of parts of the hyoid chain which could not be explained by the de generation of ligament It is very probable also that in some cases in which the bony rod is slender the cartilage has per sisted and become bone because this is more likely than that fibrous tissue should have ossified at that age but in the former cases the bar of bone is so large that one can only account for it by supposing that the *original cartilage con* tinued to grow and then underwent ossification In these cases the rod is not one continuous piece but is made of several segments which generally present enlargements at their points of junction The joints between these pieces have not re ceived very satisfactory description The fact is that they apparently are not true joints at all but that the still carti laginous ends of the pieces play one on another within the enveloping fibrous tissue which is continuous with the peri osteum The apposed ends of the bones have the appear ance of having been connected by cartilage and ultimately they become anchylosed to a greater or less extent which indeed is an ultimate degeneration Other instances of senile degeneration which has attacked the already abnormal struc ture will be alluded to in the account of the cases

II

Description of Cases—I shall now describe three recent specimens of my own observation, then two more also in the Warren Museum of the Harvard Medical School which have never been described at length, after which I shall give a short account of several cases recorded in literature, and then give a short summary of the results of the study

SPECIMENS IN THE WARREN MUSEUM

CASE 1 (Figs 1 and 2)—White, male, old The chain of bones consists on each side of three pieces besides the lesser horn, which on the right is very small and ill defined, lying in the mass of fibrous tissue which passes from the piece above it to the hyoid On the left it is represented by two nodules, one above the other The first piece on both sides measures 2 cm and is enlarged at the lower end, which is movably attached to the second piece, which measures 4 cm on both sides Its lower end is also slightly enlarged It is movably attached on the right, but on the left is fused with the third piece, which is directed strongly forward on either side so as to be approximately parallel with the great horns of the hyoid This third piece measures 2.9 cm on the right and only 1.5 cm on the left On the right it is continued to the hyoid by a ligament only some 3 mm long, which encloses the rudimentary lesser horn On the left the two nodules are enclosed in a ligament of some 7 mm The largest diameter is about 6 mm near the lower end of the first piece on the left Although certain joints were noted, they disappeared when the specimen was dried It may be considered practically certain that there was no motion of any importance between the different pieces, excepting in the neighborhood of the hyoid This peculiarity was happily discovered during the dissection before very much had been removed, so that the subject still had the outlines of a human body rather than those of an anatomical preparation The X-ray reproduced in fig 2 was taken as soon as possible It is, so far as I know, the first of its kind

CASE 2 (Figs 3, 4 and 5)—The next case was observed at about the same time H 402 Male, black, age unknown but young, apparently about twenty-five This may be called an instance of very long styloid processes It was noted during the dissection that they seemed to reach to within one or two centimetres of the hyoid No stylo-hyoid ligament and no lesser horns could be found The length is 5.9 cm on the right and 5.3 cm on the left, but measurements must often be only approximate from the difficulty of getting a really satisfactory and precise starting point The condition is quite different on the two sides On the right the tympano-hyal projects but very little beyond the vaginal process It is connected by fibrous tissue to a long, slender rod, presenting something of an enlargement at its middle, which marks a change of direction At first

it runs forward and downward and then inclines inward as well. There is another bend just before the point. On the left the process is much straighter. The tympano-hyal which is much stronger than on the right projects far beyond the vaginal process. It is connected by fibrous tissue with the stylo-hyal which runs downward and forward without change of direction except for a slight bend backward at the end. The tympano-hyal has a very much greater development on the left than on the right illustrating beautifully the principle that in such variations the same element may be of very varying importance. It is not unlikely that the point on both sides is made by the cerato-hyal but there is no way of knowing and it is of no consequence. An X-ray was taken of this head also before the dissection was very far advanced. These two cases were seen near the close of 1906.

CASE 3 (Fig 6) No 9993 Male black age 28. This specimen was found in the dissecting room a few years ago during my administration and was placed by me in the Museum. There is nothing very remarkable about the styloid processes. The feature is the strong ossification of the lower part of the chain and again the condition is not the same on opposite sides. The arrangement on the right is as follows: the tympano-hyal is not to be distinguished the stylo-hyal is ligamentous 2.6 cm in length the cerato-hyal is bone. The length is 4 cm and the greatest breadth which is at the top 5 mm. A ligament 4 mm long connects the lower end of this ossification with the hyoid. There is no lesser horn.

On the left the tympano-hyal projects just beyond the vaginal process. Next to this comes a ligament 5 mm long then an ossification the stylo-hyal 1.3 cm which is connected by a ligament 3.1 cm long to the cerato-hyal which measures 2.8 cm and is not only much shorter but much lighter than its fellow. The most important difference is at the lower end of the chain. On the left a lesser horn of 4 mm springs from the hyoid and is connected by a very little fibrous tissue with the lower end of the cerato-hyal.

The two next cases have been for years in the Warren Museum.

CASE 4 (Fig 7) —No 6631 Sex age and race are not given but I have very little hesitation in pronouncing it male and I incline to think it is the head of a negro. The right stylo-hyal is a thick rod which about 1.6 cm from its origin expands into a rounded knob. The shaft's thickest line running backwards and outwards measuring 8.5 mm. The transverse diameter is 4.5 mm. Continuous with the thick rod which has been assumed to be an elongated stylo-hyal is a long slender bony process extending in a somewhat tortuous course downward and forwards. This apparently was sawn across before it was observed in the dissection. Apart from this obviously artificial division on the bony rod extends 7.7 cm from the skull (measured in a straight line) ending in a small knob. There is of course no means of knowing how the rod was connected with the

hyoid The attachment shown in the photograph is entirely artificial There is no lesser horn on either side

On the left the tympano-hyal projects beyond the vaginal process It is of about the usual size and has a rough ending as if it had once been covered with non-articular cartilage This specimen is remarkable for the very large size of the upper part of the rod as well as for its length

CASE 5 (Fig 8) —No 602 was placed in the Museum by Dr David W Cheever in 1865 during his service as Demonstrator There is no statement of age, sex, nor color The chief interest is that the chain differs from all the others It probably did not come from an aged individual, as the greater horns of the hyoid apparently are not fused with the body Owing in part to the method of mounting it is very hard to determine whether there is any element that can be called a tympano-hyal The stylo-hyal is longer on the right and thicker on the left The cerato-hyal is of about the same length on both sides, but is separated from the preceding piece by a longer ligament on the right than on the left This condition is reversed below this ossification, the ligament going to the lesser horn being longer on the left These horns measure each 3 mm and are fused with the greater horns Thus there is a general correspondence between the two sides with a difference in details

Passing now to cases recorded in literature and without making any attempt at a complete account of all cases observed I give several which strike me as the most interesting and which illustrate the variety of details presented by this abnormal ossification

CASE 6 —GEOFFROY-SAINT-HILAIRE describes a specimen given him by Serres The body of the hyoid bone was very large, somewhat resembling that of American monkeys The greater horns were slender and very wide spread The first piece of the chain, which he calls the styloid, was long and thick, while the cerato-hyal and the apo-hyal (hypo-hyal) were slender, long and straight and swollen at their ends The last mentioned was longer by a quarter than the one above it These two appeared to have been but recently united together, and the same is true of the first piece and the vaginal process, although the man was fifty-six years old Ligamentous fibres connected the lesser horns with the body of the hyoid This condition was found only on the right

The following three cases reported by the late Professor Saturnin Thomas, of Tours, are taken from the paper by Retterer

CASE 7 —Male, aged thirty There was a swelling below the vaginal process at the junction of the tympano-hyal (*prolongement hyoïdien*)

F



C 1

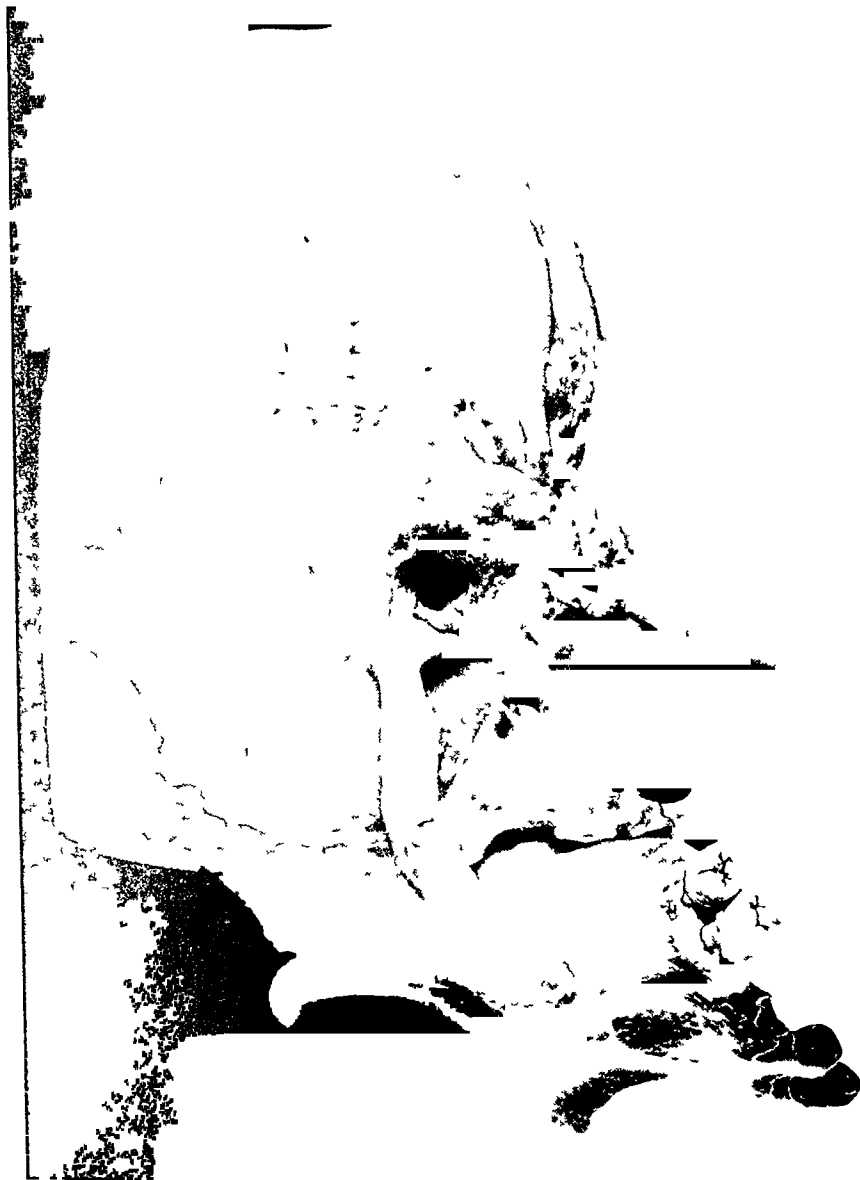
FIG 2



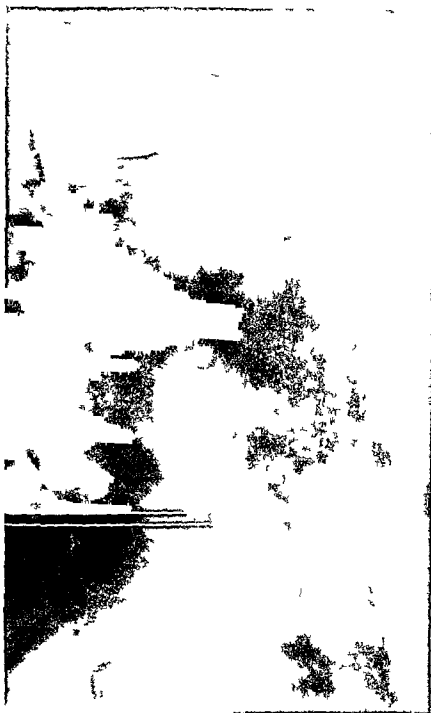
An X ray of Case I when only partially dissected The stylo hyoid chain of one side is shown clearly



FIG 4



CASE II —Left side The strong tympano hyal is very prominent There is no bony union between it and the stylo hyal



A X y l C ll wh ly p rt lly d ed d bel tl k ll h d bee d ded
 B h ylo-by d h l h w

FIG 6

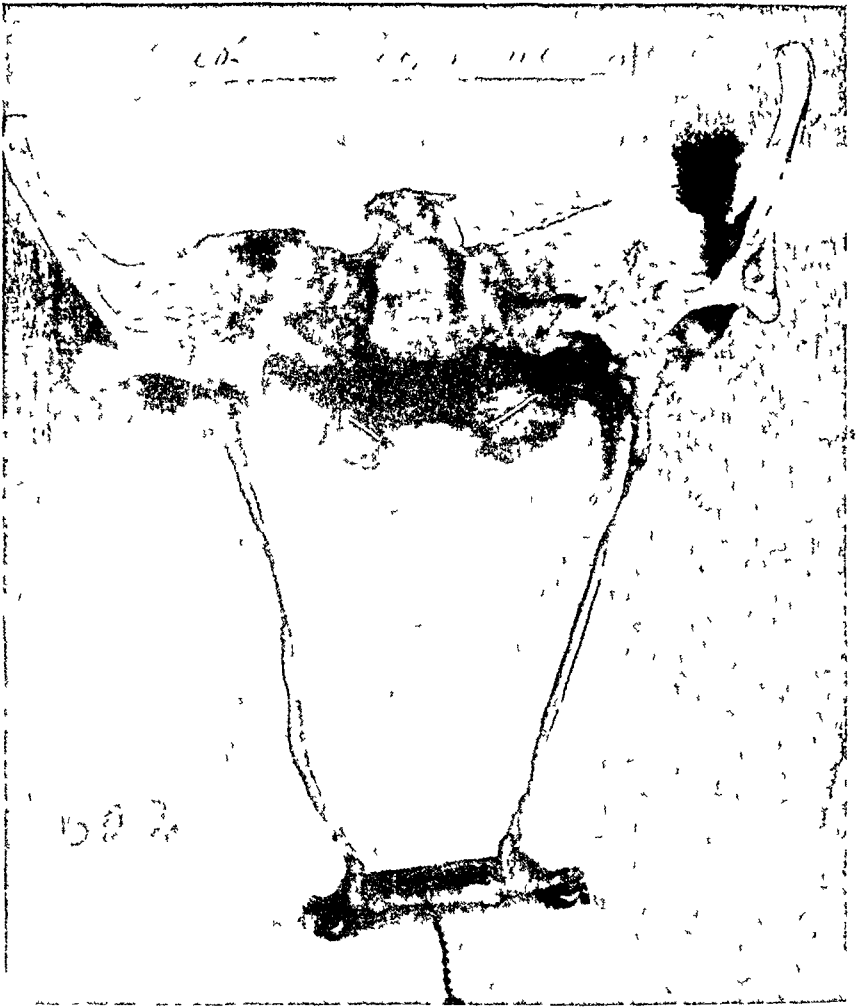


CASE III —The lower part of the cerato-hyal is a strong bony rod on both sides

OSSIFIED STYLO- HYOID LIGAMENT

C IV—Th lag fi tp i p b bly mm ymp o-hy l w th w l h l f d
tylo-hy l d ra o-hy l d

FIG 8



CASE V —The ossification is irregular and asymmetrical

with the styloid. The lower end of the latter articulated with the ceratohyal which was continued by ligament to the hyohyal or lesser horn.

CASE 8.—The vaginal process was continuous with the tympanohyal of which the lower end was fused with the first piece of the stylohyal which had a fusion at its junction with the ceratohyal.

CASE 9.—Female aged fifty. The lesser horn was elongated as in animals. The ceratohyal was very small and not joined to the piece above it.

No mention is made in the abstract by Retterer as to whether these conditions existed on one or both sides.

CASE 10.—SAPPEY in the third and fourth editions of his Anatomy give a fine illustration but no description of a case of this kind. Perhaps it is the often mentioned one in the Musée Orfila. Describing it from the drawing it appears to be essentially symmetrical on both sides. The tympanohyal projects some distance beyond the vaginal process and ends in an enlargement which meets a similar enlargement of the stylohyal. This is the largest point of the bony chain. Below this comes the ceratohyal which is connected to the lesser horn by ligament. The drawing represents it as completely fused with the stylohyal on the left. In spite of the author's use of the word *soudure* the other above mentioned joints would appear from the drawing to persist.

CASE 11.—GRUBER reports an instance of ossification on both sides in an old person which apparently was observed on a macerated skull. The hyoid apparently had been lost but the bony rods were so long and came so near together below that one cannot doubt they very nearly reached that bone. The drawing represents them ending in sharp points which we are told were 11 or 12 lines (say an inch) apart. The two rods were equally long and showed occasional swellings. The left one was rather stronger than the right. Both had a bend near the middle that in the right one being the greater. The part above the bend was slightly curved on both sides and the lower portion straight.

CASE 12.—POIRIER and MEUNIER had a remarkable case of very perfect ossification of this ligament from a person sex not stated of thirty years. The greater horns of the hyoid were remarkable for their size and for the presence of a small nodule at their ends connected with them by some kind of a joint. The stylohyoid ossifications of the two sides were

of the hyoid surrounded by fibrous tissue connecting it both with the last mentioned bone above and with the hyoid below.

CASE 13.—The following case from a man of sixty-four reported by MEUNIER is in one respect unique—namely that the hyoid bone and the (ossified) thyroid cartilage were united. The ends of the greater horns of

This is unique among variations of this class but Debierre describes a hyoid which had true joints on the under side of the ends of the greater horns to articulate with the tips of the thyroid horns.

the hyoid were connected with the superior horns of the thyroid by joints which apparently once had been true joints. On the right, indeed, the joint was quite lost, being represented merely by a swelling. On the left the joint still existed, but in such a condition that there was no motion on either side. The hyoid in this case was peculiar. The body was large and deeply hollowed. Moreover it was surmounted in the middle by a tubercle projecting towards the muscles of the tongue suggestive of the *uro-hyal* of mammals. The stylo-hyoid chains were not symmetrical. The right one was slender and nearly straight. It consisted of the stylo-hyal, the epi-hyal, which was a small nodule in the ligament from the stylo-hyal, to another long piece which represented the cerato-hyal and the hypo-hyal. A swelling at the lower third marked the point of their union. The left chain was larger and more tortuous. First there was the stylo-hyal joined by a fibrous sheath to a long second piece, 5 mm thick, which represents both the epi-hyal and the cerato-hyal. The point of union is marked by a swelling at the upper third. This compound second piece ended below in a swelling which rested on the outer end of the body of the hyoid, but leaving room between it and the greater horn for the presence of a detached nodule as large as a pea, which is the hypo-hyal. I infer that the chains were continuous with the temporal bones, but this point is not stated as clearly as could be wished. On the right there was some play between the first and second pieces, and on the left there was more motion at the different joints. It is tolerably certain, as the author implies, that the joints were degenerating and that earlier in life they permitted more motion. The thyroid was abnormally close to the hyoid.

CASE 14—REITTERER's case is a very striking one. It was observed on both sides of a man of sixty. The body of the hyoid was very large, with widely diverging greater horns. The two sides differed considerably. On the right the bony rod measured 9.5 cm, with an average diameter of 5 mm. It consisted of two pieces, the upper measuring 2.5 cm and the lower 7 cm. There was an enlargement at their junction which was surrounded by fibrous tissue and at which some indefinite motion was allowed. The upper piece rested against the vaginal process and was not fused with the temporal, the lower was attached to the hyoid by fibrous tissue. On the left the styloid, 1 cm long, was fused with the temporal (Very probably this was the tympano-hyal). Its lower end was attached movably to the stylo-hyal, 1.5 cm long, from which a cord ran to the cerato-hyal, 3.5 cm long. The lower end of this was continued by a ligament of 1.5 cm to the lesser horn, which measured 2 cm and was movable on the hyoid. These two chains passed about 2 cm internally to the ramus of the jaw and were connected with the fibrous tissue covering the internal pterygoid.

The following case by Turner much resembles case 4.

CASE 15—"On the right side of a male subject, the styloid process, 31 mm long, was from two to three times as thick as customary, and instead of ending in a point, formed an expansion, 13 mm in antero-poste-

rior and 9 mm. in transverse diameter. Below and articulated with it by a movable joint was a bar of bone 56 mm. long which passed downwards to articulate with the small cornu of the hyoid. This bar was thickest at its upper end and measured 10 mm. antero posteriorly and 8 mm. transversely whilst at the lower end its dimensions were only 4 by 3 mm. The small cornu was somewhat thickened and had its usual articulation at the junction of the body with the great cornu of the hyoid which part of that bone had their customary appearance. When the right arrangement in this neck is compared with the normal condition in a dog the bar of bone is seen to be the homologue of the epihyal bone in this and many other mammals. There was no vestige of a right stylo-hyoid ligament the place of which had been taken by the epihyal.

The left side was practically normal.

CASE 16.—MR. E. T. PORTER exhibited before the Dublin Pathological Society a specimen of abnormal styloid processes which as he observed was of more interest from an anatomical than a pathological point of view. They were styloid processes much longer than usual and not so firm and osseous but rather slender and flexible. They were attached to the temporal bone by cartilage instead of bone and in the same subject there was no styloid muscle or ligament. They were situated between the carotids and so placed that it would have rendered ligature of either vessel extremely difficult.

CASE 17.—The following very remarkable case described by KOSTANECKI is unique. It was observed on the left side of a man of sixty-four. A projecting plate of bone turned back and from where the angle of the lower jaw should have been and played against a really immense styloid by what may be called a false joint or a bursa but the description is inadequate. The styloid or more accurately the stylohyoid chain consisted of two long pieces with a small flat rounded piece of bone of regular shape between them which was connected by a false joint with each of the others. The first piece was a thick rounded rod descending from the skull and becoming broader below. The lowest piece short and thick was connected by a ligament (which must have been a short one) with the lesser horn. The intermediate piece was surrounded by a dense envelope of fibrous tissue seemingly continuous with the periosteum of the others. The process on the lower jaw was against the joint below the intermediate piece when the mouth was closed. It was learned that the man had had no symptoms during life.

Besides the above which may be called dissecting room cases or museum specimens there are a few clinical observa-

It may be questioned whether this case should have been admitted for of course if we are to record uncommonly long styloids there will be no end to it. But it must be remembered that styloids which deserve to be called much longer than usual probably reach very nearly to the hyoid like those of my second case as was noted in the dissection and confirmed by the X ray.

tions on the living As long ago as 1870 Lucke reported two cases

CASE 18—The first was that of a woman of thirty who had long suffered from difficulty in swallowing An examination of the fauces made both within and without, revealed on the right a long slender process which pressed the tonsil inward

CASE 19—His other case was that of a girl of twenty, who also had difficulty in swallowing Again there was found on the right side a slender, bony process which pressed against the tonsil It is stated moreover that in this second case it narrowed the posterior nares on the right

The first and most important deduction to be made from these cases is that the usual term "ossification of the stylohyoid ligament" is wrong and misleading On the contrary, they support the contention that this condition is due to a continued growth and subsequent ossification of the second branchial cartilage This does not prevent a degenerative ossification from playing a minor part which probably manifests itself most strongly in the destruction of the joints between the different pieces occurring late in life

The condition is a theromorphic one, that is, one in which parts of the human body show an exceptional structure which is normal in certain animals as a consequence of a common plan of development

In at least three instances the hyoid was enlarged In that of Serres "the body of the hyoid was very large the greater horns slender and very wide-spread" In that of Poirier and Meunier "the greater horns of the hyoid were remarkable for their size" In Retterer's "the body of the hyoid was very large with widely diverging greater horns" It is likely that this would have been recorded much more frequently had all the hyoids been examined

The sex is given in 12 cases Of these 9 occurred in men (to which might be added one in which I made the diagnosis from the skull) and only 3 in women

As to the age 6 were fifty years or more and 6 less than fifty Assuming that I was right in estimating the age of

my second case at about twenty five none of these 6 had reached thirty one years It is clear that old age is not a factor

The condition is usually bilateral It is so in 10 of these cases in 5 it is on the right and in 1 on the left There is no statement concerning 3 instances

While it may be said that those in which the ossification was found on both sides were in the main symmetrical yet it is common to find considerable departures from symmetry in the details such as the value of certain elements of the chain and arrangement and efficiency of certain joints

The condition of the joints between the different pieces including the lesser horns of the hyoid is very uncertain In many cases it would appear that joints once present had degenerated but there is no single case in which the hyoid is firmly attached to the chain so that no motion is possible between them The nearest approach to this is in Mcunier's case (13) in which there is a bony connection in an old man between the thyroid and the hyoid a change which as mentioned above probably occurred late in life In short there is usually more or less play between different parts of the chain and practically always near the hyoid sometimes by a joint below the lesser horns and sometimes by a joint or more often a ligamentous connection above

III

The clinical deductions I venture to assume to be the following

It is to be remembered that a bony rod may extend from the styloid process to the hyoid It may be slender or thick In the former case it is at least in early life more or less flexible and elastic in the latter it presents enlargements which at first as a rule mark the position of joints This rod passes between the carotid arteries and may interfere with operations for tying them and with those on the parotid gland which it probably indents on the inner side Passing by the internal pterygoid to which it is attached by the fibrous en

velope of that muscle, it lies against the outer side of the tonsil which it may indent or displace. It evidently would interfere with excision of the tonsil by the tonsilotome or otherwise. Some years ago I received a letter from a laryngologist who had come across such a structure while operating. I believe that others have had the same experience but I know of no instance which has been reported. The displacement of the tonsil may be sufficient to seriously reduce the approach to the pharynx and even to encroach on the region back of the posterior nares.

It may give rise to difficulty in swallowing. In this connection it is worth noting that the two cases observed during life by Lucke were both young. One would think that the trouble would be greater after the solidification of the joints, especially if the joints above and below the lesser horns of the hyoid should be involved, but as yet there is no clinical evidence.

It is not unlikely that the play of one part of the larynx on another should give rise to disagreeable subjective symptoms and even to sounds that could be heard by others, although Kostanecki's remarkable case (17) shows that this does not necessarily occur.³

A diagnosis may be made by bimanual examination and the X-ray would settle the matter.

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³ The late Professor Henry J. Bigelow told me many years ago that perhaps the most curious case he had ever seen was that of the "clicking woman," who, I believe, went for advice to the Massachusetts General Hospital, and left not only unrelieved, but without the satisfaction of a diagnosis. As well as I can remember she was troubled by a continual, plainly audible clicking, which seemed to be produced in the region of the larynx.

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ACUTE DILATATION OF THE STOMACH—GASTRO-MESENTERIC ILEUS

BY JOSEPH C BLOODGOOD, M D,

OF BALTIMORE MD

Associate Professor of Surgery in the Johns Hopkins University

IN the study of 459 cases of hernia finished in January, 1899 (The Johns Hopkins Hospital Reports, vol vii), I was not familiar with postoperative or primary acute dilatation of the stomach. For this reason I looked upon the only example of postoperative obstruction in this group of cases as a high intestinal partial occlusion. The patient was relieved, and recovered without a secondary operation.

In May, 1901, I operated for the first time for symptoms of intestinal obstruction following an operation under chloroform narcosis for reducible inguinal hernia. In this instance a loop of jejunum was caught in Treitz's fossa. The patient recovered. In the report of this case (ANNALS OF SURGERY, 1903, vol xxxviii, p 806) the possibility of an acute dilatation of the stomach is not discussed.

Later these two cases will be mentioned in the differential diagnosis between gastro-mesenteric ileus and high occlusion of the small intestine.

In March, 1904, my attention was first called to this postoperative complication in a case of appendicitis, here the clinical picture was distinct, the rapid epigastric distention associated with vomiting of large quantities of duodenal and gastric contents, and the rapid prostration differentiated the lesion from a high intestinal obstruction. The autopsy by Dr Fisher confirmed the clinical diagnosis.

Such a distressing experience called my attention to the literature, which I should have been familiar with before. From now on I kept this postoperative complication in mind.

In September, 1904, when Dr Sowers told me of the clinical picture of a patient who had died that day in the

surgical ward of the Johns Hopkins Hospital and on whom an autopsy was about to be performed it was not difficult to conclude that death was due to a gastro mesenteric ileus. The illustrations (Figs 3 and 4) were made from my sketches taken at the autopsy. This case operated upon by Dr Finney has been reported by him (Boston Medical and Surgical Journal vol clv August 2 1906 p 107)

In July 1906 I observed for the first time a lesion of the duodenum and the stomach which I think may be looked upon as a primary *chronic* gastro-mesenteric ileus or chronic dilatation of the duodenum and stomach (see Fig 6)

In March 1907 I saw for the first time a case of primary acute gastro-mesenteric ileus. The complication had its onset during the convalescence from a very severe attack of acute articular rheumatism (see Figs 1 and 2)

In discussing the cases which have come under my observation I feel that the subject can be presented best by first giving in detail the last observed case. Here the clinical picture was unusually distinct and I was able at the operation and autopsy to investigate the pathologic anatomy

CASE I Path No 8025 J D patient of Drs Pound and Seegar

Primary acute gastro mesenteric ileus symptoms three and a half days onset during convalescence from a severe attack of acute articular rheumatism. The symptoms began directly after the first solid meal in a patient greatly emaciated and weakened by a long illness. The symptoms consisted of epigastric distention gastric dilatation and peristalsis vomiting of large quantities of gastric and duodenal contents flatness of the lower abdomen and absolute constipation. The leucocytes were 40 000. There was no fever.

Operation great dilatation of stomach and duodenum up to the mesentery collapse of the small intestines jejunostomy death (Figs 1 and 2)

I saw this patient on March 11th 1907 with Drs Pound and Seegar of Baltimore. The patient was a male aged twenty four. He was the only child of rather poorly developed parents and had always been delicate. About six weeks before he was taken

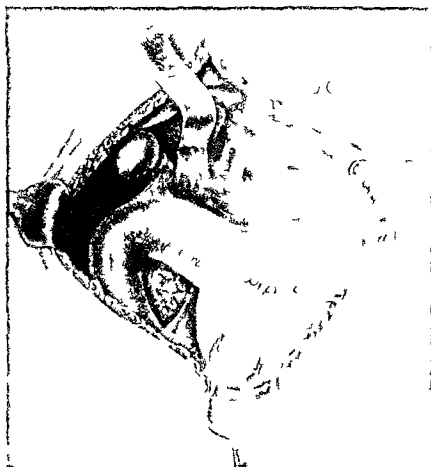
with an attack of high fever associated with great swelling of many joints. The condition was looked upon as acute articular rheumatism. He was critically ill. There was every evidence of some cardiac lesion. After the fever disappeared and the joint symptoms subsided the patient continued to have a very rapid pulse. His emaciation and weakness became extreme. During the beginning of the attack he was given large doses of salicylates.

For about a week the patient had been better, the pulse rate had reached normal.

The onset of the acute attack began a few hours after his first meal of solids which included raw tomatoes. I saw the patient three and a half days after the beginning of the symptoms. The clinical picture from the onset had been the same—continuous epigastric distress, with intermittent colicky pains, fullness of the upper abdomen, flatness of the lower abdomen, vomiting of large quantities of a dark brown fluid at irregular intervals. The constipation was absolute, the quantity of urine diminished, there was no fever. The pulse had become more and more rapid. The treatment had consisted of high enemata and cathartics. The stomach tube had not been used.

Examination —The patient is extremely emaciated, although the face is pale and sallow the lips have a bright red color. The pulse varied from 130 to 140, it was very weak. While I was looking at the patient he complained of a colicky pain and vomited about six ounces of a dark brown fluid, which contained mucus and a little blood. This fluid had a sweetish odor and did not remind me of normal gastric contents, but of the contents of the duodenum. As one looked at the abdomen there was distention in the epigastrium with an almost scaphoid abdomen below. When the patient complained of a colicky pain one could see a broad peristaltic wave pass from left to right in the area of distention between the costal margin. The distended area was tympanitic, and this tympany extended on the left to the nipple line above and the posterior axillary line behind, less to the right, partially obliterating the liver dullness. On palpation one could not positively make out the stomach because the muscles were held rigid and the patient complained of some tenderness. The lower abdomen however was soft, the rectal examination negative.

A diagnosis of gastro-mesenteric ileus was made and the possibility of a high intestinal occlusion considered.



C I-A t ga i i d l d i i t t Appe r f t m h d d d m t pe
t A th et

FIG 2



CASE I—Acute dilatation of the stomach and duodenum. Appearance of stomach, lower portion of duodenum, mesentery and collapsed jejunum, transverse colon lifted up. Author's case.

After the patient reached the St Agnes Hospital the leucocytes were found to be 40 000. During his transportation he continued to vomit and the pulse had increased to 150. On passing a stomach tube at least a litre of dark brown fluid was evacuated. It required at least ten minutes before the washings came away clear. This suggested that there was a dilatation at least of the duodenum as well as the stomach. The patient was given a subcutaneous salt infusion. The distention rapidly disappeared, his pulse improved and he said he was more comfortable. After an observation of one hour the distention returned. I now thought that perhaps the condition might be due to a high intestinal occlusion for which operation was indicated and for this reason advised exploration of the abdomen. I am now of the opinion that this was a mistake and that treatment by the stomach tube and salt solution infusion should have been continued. This treatment is the best for gastro mesenteric ileus and in this instance if there had been an intestinal occlusion lower down an operation three and a half days after the onset upon a patient so critically ill would promise too little to justify the procedure especially as the symptoms favored gastro mesenteric ileus. I consider the operation at this time in this case a mistake in judgment.

Operation Findings—When the abdomen was opened through the right rectus under cocaine infiltration an enormously distended stomach presented itself. The lesser curvature was pushed against the liver, the greater curvature below the level of the umbilicus. As the stomach was full of gas it bulged out of the wound like a balloon and I had to push it back into the abdomen to examine the duodenum. The duodenum appeared as a dilated U shaped tube situated high under the liver, the base of the U lay a little to the right of the gall bladder notch (Fig 1). I wish to emphasize first that there is no gastropnoxis. Although we see adhesions between the duodenum and the gall bladder in the region of a normal mesenteric attachment these have not produced the obstruction.

The transverse colon was collapsed and when I lifted it with the omentum out of the wound I exposed the dilated stomach and duodenum (Fig 2). The duodenum was tense and dilated up to the position of the mesentery. On the other side the jejunum was collapsed. The stomach and duodenum appeared like a

blown-up balloon, the duodenum fixed, the stomach movable. At the position of the junction of the duodenum and jejunum over which the mesentery and its vessels pass, the stomach pressed downwards with great force. There were no adhesions at the position of obstruction, nor could I by compression force anything from duodenum to jejunum. The obstruction was situated directly behind the mesenteric vessels. As shown in Fig 2 the duodenum, before it passes beneath the mesenteric vessels through the mesentery, curves upwards and then, as it passes through the mesentery and becomes the jejunum, curves downwards, like the letter S. All the small intestines were collapsed, and it did not appear to me that their position was unusual. In many autopsy cases it is noted that the majority of the small intestines is in the pelvis. I could not demonstrate this in my case. It is very difficult to illustrate correctly the exact picture. The operator obtains his view of the duodenum first on the upper side of the colon, then on the lower by pulling the transverse colon up and down. He sees the contrast between the dilated duodenum and the collapsed jejunum by looking first to the left of the mesentery, and then to the right. The greater portion of the dilated stomach does not come into view. The diagnosis of an obstruction at the duodeno-jejunal junction is first suggested by the continuation of the dilatation of the stomach into the duodenum—an entirely different picture from that observed when the obstruction is at the pylorus. The diagnosis is confirmed the moment one lifts the transverse colon and exposes the duodenum and jejunum. In the case under discussion it required less time to see these things and to make the diagnosis, than to describe them.

Finding that I could not compress the contents of the duodenum into the jejunum, although I could pass my index finger through the mesenteric opening, invaginating either duodenum or jejunum, I decided to do a jejunostomy, and pass a tube into the duodenum. This was done with immediate relief. I considered that this procedure was more rapid and met the indications as well as a posterior gastroenterostomy. In addition, it evacuated the duodenum as well as the stomach.

The patient survived the operation about two hours. On opening the abdomen at the autopsy the tube was found in the duodenum which was empty, but still somewhat dilated, the stomach was very much smaller, but still large and practically empty.

Perhaps the duodenum was situated higher than usual in this case but it seems to me that the high situation could be explained by its great distention and can be excluded as a factor in the obstruction.

Here is an undoubted observation of acute dilatation of the entire duodenum and stomach with no evidence of adhesions and no gross anatomical changes at the duodeno jejunal junction different from normal. Whether dilatation was primary in the stomach or duodenum could not be established.

CASE II Pathol No 8326 S H previously reported by Dr Finney (loc. cit.)—*Acute postoperative gastro mesenteric ileus Death six days after operation (pyloroplasty Finney's method) Continuous vomiting with rapid pulse after operation Mouth excoriated by pancreatic juice in the vomitus Autopsy (illustrations Figs 3 and 4)*

The patient was a white female about thirty five. Three years previously she had an acute attack of an abdominal lesion diagnosed acute gastritis which had kept the patient in bed for three months. The details of this attack are not given in the history. The patient continued to suffer from epigastric distress and belching after eating. Two months before she was admitted to the medical clinic of the Johns Hopkins Hospital an operation had been performed on some pelvic organ. Since this time the patient has vomited almost daily.

From June 17 to September 7 a period of almost three months she was under treatment in the medical clinic. The chief symptom was inability to retain food. In spite of attempts at careful feeding and rectal enemata with absolute rest in bed the patient lost weight and strength and the blood count showed a progressive secondary anemia. At no time was it possible to make out a dilatation of the stomach nor gastric peristalsis. The residuum in the stomach was never more than 75 c.c. HCl was always absent the total acidity was low—about 10. lactic acid was present. I emphasize this clinical picture because it resembles my case of chronic dilatation of the stomach and duodenum.

At the operation by Dr Finney the stomach was but moderately dilated. The duodenum was situated high under the liver but there was no kink in the duodenum. The pylorus easily admitted the index finger. There was slight scar formation on

the anterior wall of the stomach near the pylorus There is no note whether the duodenum was examined to the jejunal junction

After operation the vomiting was worse Before operation she had only vomited when given food After operation she vomited at intervals of from three to six hours The vomitus was green and then dark brown in color, it excoriated the mouth as if it contained pancreatic juice Associated with this there was a very rapid pulse—128 to 140 At first there was moderate epigastric distention, but this with the vomiting ceased twenty-four hours before death The patient had a number of stools, more than one would expect from the nutritive enemata The stomach tube was passed on the fourth day only the result is not noted in the history

Dr Sowers told me about this patient the day I came on duty at the Hospital The clinical picture impressed me as one of postoperative gastro-mesenteric ileus As an autopsy was about to be performed, we immediately went to the pathological laboratory and found that the abdomen had been opened, and the small intestines handled Dr Francis who was performing the autopsy allowed me to examine the stomach and duodenum and to make sketches

The findings were almost identical with those described and illustrated in Case 1, except the stomach was but moderately dilated and was not pressing upon the mesentery, the duodenum was just as distended, but was not situated as high as in Case 1 This is easily explained by the fact that in the Finney pyloroplasty the duodenum is freed and pulled down in performing the suture

In Fig 3 the small intestines have been removed the stomach is not dilated The characteristic changes in the anatomy of the pylorus after a Finney pyloroplasty are beautifully shown the dotted lines represent the suture Just below this in the duodenum there is a kink always observed after this operation, but which has produced no obstruction The suture had healed perfectly, it was covered with a thin fibrinous exudate and slightly adherent to the liver The dilatation of the duodenum and its marked U-shape is well shown, and should be compared with Fig 1 When I cut away the transverse colon and the small intestines the dilatation of the duodenum up to the mesenteric vessels, and the collapsed jejunum forming the S-curve were distinctly seen, and are shown in Fig 4, which should be compared



C 11—A l i t t f h d d o d m f r y g o d d t m y
 d i g m d f m k t h b t h a r y s l l y

FIG 4



CASE II — Same as Fig 3 transverse colon cut away Note relation of mesenteric vessels to position of obstruction

with Fig 2 When I cut the jejunum near the mesentery it was empty and nothing escaped When I pressed upon the duodenum there was no leakage But when I passed my index finger through the jejunum into the duodenum a large quantity of thin brown fluid escaped and the duodenum collapsed At operation therefore in Case 1 and at autopsy in Case 2 compression of the duodenum could not force its contents past the obstruction behind the mesenteric vessels into the jejunum It seemed to me there was a valve like kink due to the tension of the distended duodenum and not to traction on the jejunum by the weight of the small intestines—an explanation quite frequently given in the literature

CASE III Pathol No 7442 Mrs R—*Chronic gastro mesenteric ileus or chronic dilatation of duodenum and stomach Exploratory laparotomy Death in twenty seven days Partial autopsy* Illustration Figs 5 and 6 of findings at operation

This patient a white female aged forty two was referred to me by Dr Carr She was a married woman and until a year ago had been comparatively well She dates her illness however to an attack of mumps from which she suffered about two years ago During her convalescence she suffered from abdominal pain and nausea which have been present off and on since During the last year she has had five acute attacks the last five weeks ago These attacks consist of pain in the left side of the abdomen with nausea and vomiting The severe attacks last about three days and are relieved by calomel Between the attacks the patient suffers with indigestion and belching With the last attack five weeks ago there was diarrhoea

Examination—The patient is thin and not well nourished restless nervous and unusually apprehensive Nothing is to be made out in the abdomen except resistance in the epigastrium and a somewhat indistinct mass situated between the umbilicus and costal margin on the right side This mass has somewhat the shape of a pigeon's egg and is about 5 by 2 cm in diameter It could be moved (Fig 5) from side to side but not from above down It was slightly tender on pressure

In view of the age of the patient and the palpable mass an exploratory laparotomy seemed justifiable

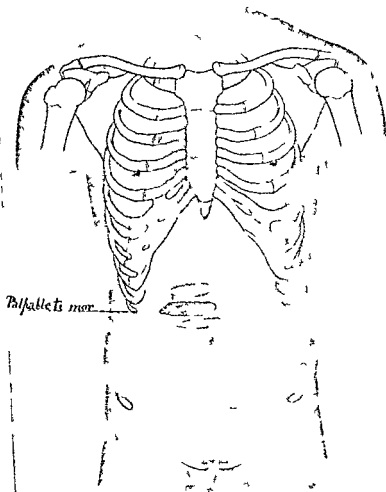
On opening the abdomen there was practically no subcutaneous fat and very little fat in the omentum The stomach was but moderately dilated There was no obstruction or scars

in the region of the pylorus. The condition that at once struck the operator as unusual was in the duodenum and pancreas (Fig 6). The duodenum was a dilated, U-shaped organ extending high up under the liver and surrounded the pancreas. The duodenum and pancreas were unusually movable, the latter felt hard and indurated, the duodenum, although somewhat dilated, was soft and compressible. There were no adhesions. The third portion of the duodenum was less movable, and of about the same caliber. The entire small intestines were unusually small and ribbon-like—a condition which I have observed in a few instances when the abdomen had been opened in patients who had taken little food for a number of weeks (starvation atrophy). The enteroptosis of the stomach was but slight. The duodenum and pancreas, although quite movable from right to left, could not be pushed down, nor could I pull the duodenum out of the abdominal wound. In my only laparotomy for extreme gastropotosis I found that I could lift the duodenum and pyloric end of the stomach out of the abdominal wound as easily as a loop of small intestine. In this case the duodenum, although dilated throughout, was compressible, and there was no evidence of any accumulation of its contents. Yet the contrast between the duodenum and the jejunum as to caliber was unusual.

I have never met with, nor read of, a similar condition, and as at this time I was somewhat prejudiced against the posterior gastroenterostomy without definite indications, I closed the abdomen. In the case of gastropotosis just mentioned, the duodenum was almost as dilated and the contrast with the jejunum almost as great. As this patient had made a splendid recovery without posterior gastroenterostomy, after rest in bed and daily use of the stomach tube, I felt that the patient in Case 3, should do as well.

After operation nausea and vomiting were prominent symptoms, but there was absolutely no distention in the epigastrium, no dilatation of the stomach, no peristalsis of the stomach. The vomiting now and then contained bile, there was never any evidence of pancreatic juice, the bowels moved normally. For a few days the patient would take food, then there would be a recurrence of the inability to retain even water. Mentally, the patient was extremely depressed and apparently made up her mind to die. The intervals of slight improvement with ability to

F 5



C x III - D gram f p lp bl bd m lt m

FIG 6



CASE III — Chronic dilatation of stomach and duodenum Sketch from operation findings Author's case

retain food for a few days encouraged the postponement of a posterior gastroenterostomy. The patient died suddenly the morning of the day selected for the secondary operation five weeks after the primary operation. Dr Carr was able to get an autopsy only after the body was embalmed and the findings were the same as at the exploratory laparotomy. The embalming fluid prevented properly stained sections of the pancreas. There seemed to be however slight interstitial pancreatitis the stomach and duodenum were practically normal.

These are the only three cases in which I have fairly complete operative and autopsy findings.

In all three cases the obstruction began abruptly at the junction of the duodenum and jejunum beneath the mesenteric vessels. In Case 1 the duodenum and stomach were tremendously dilated the duodenum fixed in a high position. In Case 2 at operation the stomach and duodenum were moderately dilated there was no positive evidence of pyloric obstruction the duodenum was not examined in its third portion at the autopsy in this case the duodenum was dilated down to the mesentery the stomach was only moderately dilated. In Case 3 the duodenum and stomach were but moderately dilated but the duodenum except in its lower third was abnormally movable. Case 1 is a typical example of primary acute dilatation. We know nothing about the condition of the stomach and duodenum before the attack. Cases 2 and 3 give a clinical history which resembles a gastric neurosis more than pyloric stenosis or ulcer. I am of the opinion that chronic dilatation of the duodenum was present before operation in both case (2 and 3). In Case 2 the condition became acute after operation. There is no evidence that the pyloroplasty was a factor in its production and there is every reason to believe that this pyloroplasty did not and could not relieve the original condition. In Case 3 the exploratory laparotomy had no effect whatever on the clinical picture. In this third case the stomach was washed out two and three times a day this procedure may have prevented acute dilatation but it had no curative effect upon the chronic condition.

Theoretically, posterior gastro-jejunostomy with a short loop may have been indicated in both cases. This procedure would have relieved gastric stasis, but might have increased the duodenal dilatation. Theoretically, also a second anastomosis between the duodenum and jejunum would have to be performed to drain both duodenum and stomach. Future experience may demonstrate that in cases of this character a simple duodeno-jejunostomy is indicated. This operation, as far as I know, has never been done, nor even suggested before. It certainly meets the indications better than gastro-enterostomy and is simpler than a combined gastro-enterostomy and duodeno-jejunostomy.

In all three cases the small intestines were collapsed, with absolute constipation in the first case, but some movement of the bowels in the other two cases. In none of these cases can it be positively said that the small intestines were in the pelvis. In the two cases which I observed at operation (1 and 3) the majority of the small intestines were not in the pelvis. Free fluid in the peritoneal cavity was absent in all, and there were no adhesions and no gross anatomical lesions to explain obstruction at the mesentery. Nor was I able to ascertain whether the dilatation of the stomach was primary or secondary.

As stated before, I am of the opinion that in Case 1 the stomach tube should have been used for a longer interval before the patient was subjected to operation, it also should have been employed by his attending physician from the onset of the disease. In Case 2 operation was indicated, the patient had been given the benefit of the best medical treatment, during which time she lost strength and flesh and became more anemic. After operation here, the stomach tube was not employed as it should have been, once or twice a day or more frequently. In Case 3 the palpable tumor was sufficient indication for exploration. In the postoperative treatment nothing was neglected. Whether this patient could have been cured by a duodeno-jejunostomy, remains to be answered by future experience in other cases.

FIG 7



CASE IV — Acute postoperative dilatation of the stomach Finney's case Photograph from alcohol specimen

CASE IV Pathol No 7352—*Acute postoperative gastric dilatation (following a Finney gastro duodenostomy) associated with pregnancy. Death one month after operation (Fig 7)*

This case I have published with the illustration in the *International Clinics* (April 1907 page 285 Fig 27) The patient was a white female aged twenty for six months she had suffered from indigestion consisting of epigastric pain and nausea. For two weeks the symptoms had been very severe with vomiting. There had been and still was discomfort directly after taking food and vomiting two to three hours later. On one occasion blood was in the vomitus. No improvement under rest and milk diet. On examining the abdomen nothing was made out except slight resistance and tenderness in the epigastrium. In the gastric secretion there was no HCl and a total acidity of 28. The patient did not improve after a month's medical treatment. Pregnancy was denied and no pelvic examination made. At the operation by Dr. Finney the stomach was found to be but moderately dilated the pylorus was slightly constricted there was no definite scar tissue but a few adhesions about the pylorus. The pylorus seemed higher than normal and it is noted that the duodenum was contracted.

A Finney gastro duodenostomy was done. After operation the patient's condition on the whole was worse—continuous vomiting which excoriated the mouth slight jaundice and bile in the urine. The possibility of pregnancy was then admitted by the patient.

Autopsy—The dilatation is confined to the stomach with a kink in the lesser curvature which however did not obstruct the pylorus (see Fig 7). The pyloroplasty wound had healed the small intestines were contracted the adhesions between the pylorus and liver noted at the operation were still present.

The fetus in the uterus indicated a four months pregnancy.

Evidently this is an example of acute gastric dilatation following operation yet at autopsy there was no evidence of pyloric obstruction. The note however on the duodenum both at operation and autopsy is not sufficiently explicit to exclude duodenal dilatation. In the specimen sent to the laboratory there is but a small piece of duodenum this is dilated.

As the patient gave a history of six months' gastric discomfort, was under treatment one month before operation, and died one month after it, the gastric symptoms antedated the pregnancy four months. The marked nausea and vomiting were of but two weeks' duration and therefore coincident with the sixth week of pregnancy. At the operation there was sufficient pyloric stenosis to explain the gastric symptoms. My colleague, Dr Williams, professor of obstetrics, tells me that he has never observed acute dilatation of the stomach in the vomiting of pregnancy. He recognizes two forms of vomiting in the gravid woman—the first—of neurotic origin—is usually cured by suggestion, the second—toxic—is only relieved by immediate evacuation of the uterus. The liver in this case, in gross and microscopic study, did not have the appearance of that observed in the toxic vomiting of pregnancy. For this reason we must look upon this case as an acute postoperative gastric dilatation, and in view of the large opening between the duodenum and stomach made by the anastomosis, we can exclude pyloric stenosis as a factor. Although unfortunately the autopsy record does not allow us to make positive statements with regard to the duodenum, I am inclined to the view that this case is identical in its etiology with the three already discussed.

CASE V, Pathol No 608, J O—*Postoperative acute dilatation of the stomach secondary to appendectomy, drainage, and enterostomy for perforating appendicitis with general peritonitis and intestinal obstruction. The patient died twelve and a half days after operation.*

This patient, referred to me by Dr Murphy of Annapolis, a white male, aged twenty, was operated on in the fourth day of an attack of acute appendicitis. The appendix, situated in the pelvis, was perforated, there was pelvic peritonitis with a considerable collection of pus requiring pelvic drainage. Two and a half days later an enterostomy had to be performed for obstruction due to the pelvic peritonitis.

The patient did very well for a number of days. The upper tube drained well, but the loop seemed to be short, because the discharge consisted of material but slightly digested. As the

patient grew weak it was necessary to rather force the nourishment by mouth. On the fifth day after the second operation the patient had sudden epigastric distention and in a few hours the pulse rose from 106 to 120. at the end of four hours he vomited 300 c.c. of fluid with immediate relief. the epigastric distention disappeared the pulse improved the vomiting ceased and the tube began to drain again. In my notes made at that time I looked upon the condition as an acute gastric dilatation due perhaps to forced feeding in a patient weakened very much by his disease. On the ninth day four days later there was a second attack with syncope as the vomiting had entirely relieved the distention the stomach tube was not used. After this attack the general condition of the patient became worse we could not use the lower loop for feeding as the obstruction was not completely relieved the rectal enemata were not well retained we were therefore forced to employ feeding by mouth. At five o'clock on the afternoon of the eleventh day there was no epigastric distention and no vomiting this had been absent for forty eight hours the patient was taking moderate nourishing without nausea the pulse however was rapid. Within a few hours it began to distend and vomit. Dr Fisher who was looking after the patient attempted to pass a stomach tube but it had such a serious effect upon the pulse that he considered it wiser to desist. The patient died in collapse a few hours later.

At the autopsy by Dr Fisher the peritonitis had subsided. The enterostomy was about fifteen feet from the stomach the intestines below this were adherent in the pelvis there was no obstruction between the enterostomy and the duodenum the stomach was enormously distended with fluid and gas. No special note was made upon the condition of the duodenum.

This case can be looked upon as one of acute postoperative gastric dilatation. There were no gross changes or adhesions in the region of the stomach to suggest pyloric stenosis. Whether the gastric dilatation was associated with a similar condition of the duodenum up to the mesentery cannot be positively stated.

CASE VI Pr Surg No 1483 J F—*Postoperative acute dilatation of the stomach following radical cure of left inguinal hernia under ether narcosis. Stomach tube. Recovery.*

White male aged fifty-eight. This patient gave no previous history suggesting any gastric trouble. He was however a thin

delicate looking man, and as the left inguinal hernia was a large one, he was carefully prepared for operation. This preparation consisted of, first, a saline cathartic then forty-eight hours' rest in bed on very light diet, no further catharsis, and effectual rectal enemata on the morning of the operation. The sac contained omentum which was reduced, the Trendelenburg position was employed for about twenty minutes.

After operation the patient very quickly had epigastric distention and discomfort, the zone of tympany indicated that the chief distention was due to the stomach, there was no vomiting, the pulse was good and the leucocytes were but 10,000 (in Case 1 the leucocytes were 40,000). This patient was given immediate relief when the stomach tube was passed, but nothing was obtained except gas, the stomach was washed out the water came away clear. On washing out the stomach one evening Dr Smead, in charge of the patient at the Union Protestant Hospital, introduced some castor oil. The next morning the oil was still in the stomach. During forty-eight hours the stomach tube was passed about four times. No cathartics were given except the castor oil mentioned. Sixty hours after operation the patient passed gas and fecal matter per rectum for the first time, after an enema. From now on there was very little epigastric distention or distress. The stomach tube was passed on only two occasions in the next five days.

The stomach tube, after operation, is not only valuable in the treatment of postoperative gastric dilatation, but also in diagnosis. If one finds in the stomach intestinal contents, this may be looked upon as an almost positive sign of intestinal obstruction or gastro-mesenteric ileus.

Some six months later this patient was again operated on for a small right inguinal hernia associated with undescended testicle. In view of the previous complication local anæsthesia with cocaine was employed. After this operation the same symptoms appeared, slighter in degree and of shorter duration, and were again relieved by the stomach tube. On both occasions there was no accumulation of fluid in the stomach. The distention was entirely due to gas.

It seems unnecessary to lengthen this article by a long discussion of the literature. *Finney* has presented the subject

in a very systematic manner in the Boston Med & Surg Journal August 2 1906 Halstead of Chicago (Surgery Gynecology and Obstetrics vol 11 1906 p 13) reports an observation of his own in which the patient died after an operation consisting in fixation of the kidney In this case the stomach and first portion of the duodenum were dilated the obstruction was situated in the descending limb of the

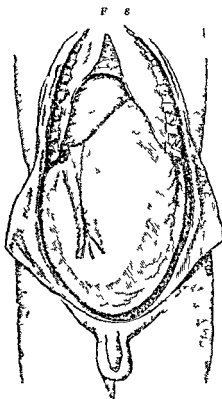


Fig 7. Acute primary dilatation of the stomach and first portion of the duodenum. Case of Finney.

duodenum as it passed beneath the peritoneum Other cases with obstruction at this point have been reported the huge stomach was somewhat V shaped like in Finney's case (Fig 7)

In the *International Clinics* for April 1906 p 285 and April 1907 p 284 I have given a brief resumé of the more recent literature.

WICHERN (*Mittheilungen a d Grenzgeb d Med u Chir*, 1906, vol xvi, page 791) is the first to record this complication during the acute stage of typhoid. At the autopsy in his two cases there was no dilatation of the duodenum, differing, therefore, in the anatomical findings from my Case 1. This complication has been observed during the convalescence from typhoid and in the acute stage of pneumonia and scarlet fever.

In C HILTON FAGGE's original communication (*Guy's Hospital Reports*, series iii, vol xviii, 1872-3, p 1), to which all writers refer as one of the earliest contributions to the subject, there is no note on dilatation of the duodenum. The V-shaped appearance of the hugely distended stomach is shown in Fig 8, copied from Fagge. His two cases were not post-operative, but primary. In Fagge's Case 1 the cause of the obstruction was a retroperitoneal abscess communicating with the duodenum, probably due to perforating duodenal ulcer. In his second case there was no demonstrable cause for the obstruction.

Fig 9 is copied from THOMSON (*The Lancet*, 1901, vol 11, p 1113). It illustrates the V-shape of the hugely dilated stomach, which was observed at autopsy, the patient also suffering from acute lobar pneumonia and pleurisy. In this case the dilated stomach reached the pubes. There is no note on the duodenum. The autopsy record simply states that the small intestines were collapsed.

Fig 10 is copied from a second communication by THOMSON (*The Lancet*, 1902, vol 11, page 287), and illustrates the autopsy of a case of acute dilatation of the stomach associated with dilatation of the upper eight feet of the small intestines. The complication began just before the birth of the sixth child of the patient and continued after it. The patient died about forty-eight hours after labor. The autopsy revealed purulent peritonitis from a ruptured ovarian abscess.

Thomson uses this case as evidence against the view that in acute dilatation of the stomach and duodenum the distention begins at the mesentery, and that the lesion is a gastro-duodenal mesenteric ileus. There is no doubt that acute dilatation of the stomach has been observed to cease at the pylorus, in different portions of the duodenum, and, in a few instances, to extend below, into the jejunum. However, in the majority of cases the dilatation ends at the mesentery. I must agree with Thomson that this finding does not prove that the primary dilatation is in the duodenum, and that the mesentery is the etiological factor in the obstruction. Nevertheless, for practical purposes, it seems best to look upon this lesion as a gastro-duodenal dilatation, and if treatment by the stomach tube fails, not to neglect, at the operation, a careful exploration of the duodenum.



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A t d l t t f t h t h o c t d w t h h d f t f t h i p e g h t f e e t f
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If the dilatation ends at the pylorus gastrostomy or gastro-jejunostomy should be performed. If the dilatation involves the duodenum I would advocate jejunostomy as employed in my first case or duodeno-jejunostomy.

The Differential Diagnosis between Acute Gastro duodenal Dilatation and High Obstruction of the Small Intestines
In view of the fact that in the first lesion the consensus of opinion favors treatment by the stomach tube and position of the body (knee chest or left lateral with elevation of the pelvis) and that in the second lesion immediate operation is indicated it seems important to ascertain if a differential diagnosis is possible.

High intestinal obstruction is about as rare as acute dilatation of the stomach and duodenum. The following cases which I have observed apparently demonstrate that a differential diagnosis is possible.

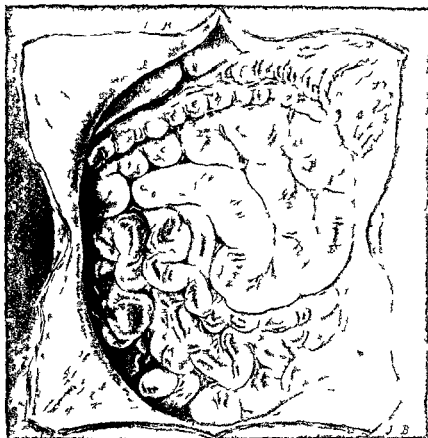
CASE VII—*Postoperative intestinal obstruction loop of jejunum in Trendelenburg's fossa. Operation. Recovery. (Previously reported in Annals of Surgery vol xxxiii 1903 p 807)*

As an etiological factor it is of sufficient interest to know that this patient—a physician aged fifty—dosed himself with cathartics for thirty six hours before operation and then a few hours before operation took paragoric to check the diarrhœa. The operation was a simple one for an oblique reducible inguinal hernia. The dissection was begun under cocaine and completed under chloroform. Vomiting with intense retching began the moment the patient came out of the narcosis and continued. The vomitus was at first bile stained and later had the odor and contents of the jejunum. There was never acute pain but general abdominal discomfort. Forty eight hours after operation I noted that there was moderate asymmetrical distention of the right upper abdominal quadrant with increasing obliteration of the liver dullness. There was not the epigastric distention and distress observed in acute dilatation of the stomach. With the rectal tube some gas and fecal matter came away. The leucocytes rose from 12 000 to 16 000. There was no collapse. In Case I of acute dilatation of the stomach the leucocytes were 40 000 and collapse was marked. In view of the increasing obliteration of

the liver dullness and the vomiting of distinctly fecal matter the abdomen was opened fifty-six hours after the first operation. There was no free fluid. On manipulating the small intestines I found some distended and then I withdrew a loop with a definite constriction. The distention extended to, and abruptly ended at, the constriction, beyond this the intestines were collapsed. The constriction seemed to be in the lower portion of the jejunum and had the appearance as if the bowel had been impacted in one of the anatomical fossæ within the peritoneal cavity.

CASE VIII, Pathol No 7005, T W S—*Acute intestinal obstruction due to the impaction of a bolus of food. Operation two and a half days. Death* (Figs 11 and 12)

The clinical history in this case suggested acute dilatation, but the physical signs were those of high intestinal obstruction. The patient was a physician, aged sixty-nine, an unusually strong, robust, fat man. The symptoms began some hours after an unusually large Christmas dinner. He was first uncomfortable all over the abdomen, then there was localized pain on the left side between the umbilicus and the tenth rib. Twelve hours after this heavy meal the pain was so intense that he became nauseated, later vomiting, which within twenty-four hours became fecal in character. I saw the patient two and a half days after the onset. The pain had been less the last twenty-four hours, the vomiting of fecal matter continued. The patient did not look very sick, the pulse was 90°. There was no epigastric distention. The liver dullness was not obliterated. There was a distinct area of dullness and fullness in the left flank which was replaced by tympany when he turned on the right side. Although the character of the vomitus resembled that of Case I of acute dilatation of the stomach and duodenum, the physical signs of the abdomen were entirely different. When I washed the stomach out it contained but half a pint of distinctly fecal matter, and the washings were quickly clean. In my note made at that time I said "This small quantity of fluid in the stomach would almost exclude acute gastro-duodenal dilatation and favor obstruction in the small intestine"¹¹ Later I made out in the small intestine distinct peristaltic waves of the ladder pattern entirely different from the single broad peristaltic wave observed in Case I. On opening the abdomen there were some clear fluid and distended small intestines, the stomach was contracted, the colon collapsed (Fig 11)



C IX—High t t l b t t d l t l p p p r t f j j m t
 t d w t d l t f d d m d t m b A B B B B C C C C—d l d
 j j m X—pos f f g b dy beh d h loop Sk t h t p r a t A h c a
 (S h m p d f m B d l l k l l y O p G y l g y)

FIG 12



CASE IX —Position of foreign body and appearance of enterospasm Author's case

On pulling out the small intestines from the cecum up I encountered first a collapsed loop then a movable foreign body 55 cm long and 25 cm in diameter (Fig 12) just above this the intestine was constricted and appeared as if in my manipulations the foreign body had been slightly dislodged above the constriction the intestines were dilated. The enterolith was soft and could be easily crushed and pushed on. The constriction had the appearance of a local enterospasm and soon disappeared.

The patient died thirty six hours after operation of anuria and symptoms of autointoxication. There were a number of stools after operation but the patient continued to vomit some. The autopsy findings differed very little from those at operation. Apparently there had been complete small intestinal paralysis. The point of obstruction could not be found but as I had made an enterostomy to evacuate the distended small intestines above the constriction I could locate its position. It was situated in the third portion of the jejunum. The latter and the duodenum were distended with fluid contents and this distention with fluid was found eight feet below the point of obstruction. Beyond this the small intestines were somewhat contracted demonstrating that intestinal contents had begun to move down. The stomach was not dilated. There was very little difference between the sizes of the jejunum and the duodenum on each side of the mesentery. There was no peritonitis.

CASE IX —Intestinal obstruction from impacted gall stone in the jejunum. Operation in forty eight hours. Death.

R J white female aged eighty (patient of Dr Hamburger). The symptoms of intestinal obstruction were distinct—initial pain and collapse vomiting later becoming fecal. As the patient became more toxic the pain became less. At my examination forty eight hours after the onset there was no epigastric distention or distress there was very little abdominal distention the vomiting was small in quantity and distinctly fecal. Peristaltic waves could not be made out. The leucocytes were 18000 the patient's pulse was rapid and weak. On opening the abdomen a gall stone was found impacted in the lower portion of the jejunum or the upper ileum. The stone was removed the bowel evacuated the enterotomy wound closed. The patient died a few hours later.

CASE X —Acute intestinal obstruction by band. Operation on the third day with enterostomy. Recovery.

In this case acute dilatation of the stomach was not even suggested by the history, and the symptoms of intestinal obstruction were somewhat obscure. The patient was a healthy male, aged thirty-four, fat and a large eater. The symptoms began with abdominal discomfort and constipation. The initial acute pain and shock of high obstruction were absent. Later colicky pain characteristic of peristalsis were felt. Vomiting was present at rather long intervals. On the second day he vomited a pint of dark-brown colored matter. The distention of the abdomen was uniform and moderate. I was asked to see this patient on the third day by Drs. Thayer and Hammond. He was in excellent condition; the abdomen was but moderately distended, if peristalsis was taking place it could not be seen, as the patient was very fat. Obstruction indicated by the fecal vomiting was thought to be in the small intestine, as there was but little distention, although the history of constipation, colicky pain and late vomiting is that usually observed in obstruction of the large intestine. About the umbilicus there was an area of impaired resonance—a physical sign of fluid in the small intestine. The stomach tube brought away a large quantity of fluid of intestinal odor. On opening the abdomen, the upper portions of the small intestines were greatly distended, the obstruction was due a band in the pelvis below which the ileum was collapsed. As the band was divided the fluid contents passed. In view of the long duration of the obstruction the intestines were opened and evacuated, the opening sutured to the wound and closed for later drainage, this was again opened twenty-four hours after operation. The fecal fistula was sutured at the end of five weeks.

These cases demonstrate that the symptom-complex and the physical signs of high occlusion of the small intestine differ from acute gastro-duodenal dilatation. There are two symptoms in common—vomiting, and its fecal character. If my memory is correct, the odor of the vomitus which I carefully studied in Cases 1 and 6 (acute dilatation of the stomach) is less fecal in character than when the obstruction is in the small intestine. The character of the vomiting, however, is not sufficiently different to allow a differential diagnosis. In high intestinal occlusion initial pain accompanied, perhaps, by peritoneal shock which may later somewhat disappear, and

vomiting without marked distention are the symptoms which differentiate it from acute dilatation. In the latter the initial pain is absent the patients suffer from epigastric distress the collapse is gradual and progressive the most characteristic feature is the abdominal distention beginning in the epigastrium and in some cases extending to the pubes. This distention is immediately relieved by the passage of a stomach tube.

In high intestinal obstruction in my experience epigastric distention is a very late symptom and so far in my cases at operation great dilatation of stomach and duodenum has not been found (see Fig 11).

According to the most recent monograph by *Kayser* of which I have only the review (*Centralbl f Chir* 1907 xxxiv p 242) the mortality among about sixty cases of acute dilatation of the stomach has been 71 per cent recovery with rare exceptions has followed only the early and repeated use of the stomach tube. Among recent literature *Beck* (*Centralbl f Chir* 1907 xxxiv p 577) reports the recovery of a girl of fifteen with symptoms forty eight hours after appendectomy for appendicular abscess in the pelvis and drainage. These symptoms consisted of epigastric pain and distention. The stomach tube removed a liter of material although the patient had had no food in spite of nothing by mouth there was a reaccumulation of two liters in twenty four hours the stomach tube was used daily for four days. This observation of *Beck* demonstrates that there is a second factor in acute dilatation besides gastric atony or paralysis and that is hypersecretion. In the literature even in the most recent monograph by *Kayser* just mentioned this factor is not dwelt upon with sufficient emphasis.

The observation of *Heile* (*Mittheilungen a d Grenzgeb d Med u Chir* 1907 v *Mikulicz Supplement* p 707) is the best to demonstrate that hypersecretion is a definite factor. It is also of interest in that it illustrates that in chronic dilatation of the stomach with a history of hypersecretion one should be cautious not to select a pyloroplasty or Finney operation or a Billroth (gastroduodenal end to end suture) after pyloroc-

tomy, but perform a gastro-jejunostomy with a short loop. In two of the cases reported by me, in which acute dilatation up to the mesentery followed a Finney operation there was evidence of hypersecretion before and after operation in both cases. In my observation of chronic dilatation of stomach and duodenum there was no definite evidence of hypersecretion before, nor after operation. In Heile's case there was a history of pyloric obstruction in a woman of twenty-seven, of eighteen months' duration, vomiting of large quantities of food was the most marked clinical symptom, the contents of the stomach showed an acidity of 60, and free HCl acid, observation before operation demonstrated that the quantity of vomitus far exceeded the intake of food.

The palpable tumor proved to be, at operation, an infiltrating carcinoma in an old ulcer. After resection the duodenum was sutured to the stomach. After operation, in spite of no food by mouth, the patient began to vomit within forty-eight hours and continued to do so for sixteen days. The daily quantity averaged about three liters, it resembled gastric secretion unmingled with duodenal contents, the condition was not relieved by the stomach tube. The patient recovered after a posterior gastroenterostomy. The duodenum was not dilated, there was no mechanical obstruction at the suture, the remaining portion of the stomach which at the operation had been reduced to less than one half, was found, at the second operation, to be as large as the dilated stomach before the first.

This case of Heile, I believe, belongs to a group of acute dilatations in which further experience will demonstrate that after a sufficient trial of the stomach tube and irrigation without relief, operation is indicated when the dilatation ends at the pylorus—posterior gastro-jejunostomy, when it is a true gastro-mesenteric ileus—gastro-jejunostomy with jejuno-duodenostomy, or the latter alone, should be preferred.

Acute dilatation of the stomach is a lesion which we must be constantly on the alert to recognize, both, as a primary and a postoperative disease. Its recognition should not be difficult. Prompt treatment with the stomach tube and irrigation, re-

peatedly performed is the first requirement. [In some cases the tube may have to be passed through the nose] This should be associated with change in position—knee chest and left lateral with elevation of pelvis. When the dilatation of the stomach persists and the accumulated fluid fails to pass and the patient becomes weaker from loss of food operation should be performed.

The chief etiological factor seems to be some toxic agent in a patient weakened perhaps by previous disease and suffering from some chronic gastric lesion. In some cases the toxic factor may be sufficiently great to produce paralysis with hypersecretion in a stomach previously dilated. This was apparently so in my first case. In the observations during and after typhoid in pneumonia and scarlet fever the patient is first weakened by the disease then later the acute dilatation has its onset. It seems strange that acute dilatation of the stomach has only recently been observed in eclampsia (Audebert et Fournier *Comptes Rendus de la Soc. d'Obst. de Gynec. et de Paed.* 1907 vol. ix p. 116). My attention was called to this article by my colleague Dr Williams. In the first reported case there were two factors—the toxins of eclampsia and the chloroform used at the delivery—the condition was recognized and properly treated with the stomach tube and although the patient was critically ill she recovered. In the second case there was a third factor—a general streptococcus septicæmia from a uterine infection—in spite of early recognition and treatment the patient died within eighteen hours after the first symptom—there was huge dilatation of the stomach and in addition great dilatation of the cecum ascending and transverse colon—there is no note on the duodenum. In my Case 2 (Fig. 4) the cecum was dilated and I found an adhesion kinking the ascending colon just above the cecum not shown in the illustration. In this reported case there was an adhesion kinking the transverse colon.

In regard to postoperative acute dilatation of the stomach surgeons should give more care to the preparation of the patient before operation especially in laparotomy cases. For at least

forty-eight hours food should be very much restricted, cathartics should not be used just before operation, when the operation is for a lesion situated some distance from the stomach considerable attention should be given to this organ in the history and examination. I have already used Heile's case as an observation of the importance of properly selecting the operation for relief of gastric dilatation with hypersecretion associated with stenosis or tumor. When this dilatation follows operations upon the gall-bladder or the ducts, or any operation in which drainage has been introduced in the region of the duodenum, the drains should be loosened or removed immediately if there are any symptoms of acute dilatation. I now remember that Dr Halsted had such a case in which the symptoms began with persistent vomiting of large quantities of gastric material twenty-four hours after cholecystectomy and drainage. I have had one such observation, in which the symptoms were of a lighter degree. Both recovered after loosening of the drain and the stomach tube.

Orthopedic surgeons must bear in mind the possibility of acute dilatation in their cases of kyphosis. These patients should be cautioned against over-eating, especially after a plaster jacket is applied. NECK (Zentralbl f Chir, 1907, xxxiv, p 58) in his most recent contribution since his collective review on this subject, reports four primary cases, with three recoveries after the use of the stomach tube, in two the patients were kyphotic and gave a history of over-indulgence in food, in one patient there was a history of only an excess of food and liquid, in the fourth an overdose of *veronal* seemed to be an etiological factor. All cases had the characteristic symptoms and physical signs.

In an extensive clinical and experimental study recently brought out by BRAUN AND SEIDEL (Mittheilungen a d Grenzgeb d Med u Ch, 1907, xvii, p 533) and the monograph of Kayser (loco cit) there is nothing especially new. All the etiological factors are by no means established. These two most recent communications advocate the view that the dilatation is primary in the stomach, that duodenal dilatation

if present is secondary and this is brought about by a kinking at the mesentery. The latter is due to pressure of the stomach on the mesenteric vessels and traction of the mesentery of the small intestine. The primary acute dilatation of the stomach is brought about by the action of some toxins on its nervous mechanism.

In the observations of my own cases and now after a careful reading of the literature extending over a period of three years I am not at all convinced that we have settled either the etiology or the pathological anatomy of this affection. To me the more interesting group are those cases in which the dilatation extends to the mesentery and in which there is no evidence of a pathologic condition to explain the obstruction other than the normal anatomical factors at the mesenteric junction of the duodenum and jejunum.

I was also impressed by the fact that in two of my observations relief of tension on the mesentery and jejunum pressure on the duodenum and pushing up of the dilated stomach did not relieve the obstruction nor allow the duodenal contents to flow into the jejunum. In my first case the presence of stomach peristalsis three and a half days after the onset of the symptoms is evidence against complete paralysis and I wish to emphasize again the importance of hypersecretion.

In conclusion I again call especial attention to Case 3 which is undoubtedly an example of chronic gastro-duodenal dilatation or gastro-mesenteric ileus. Further experience may demonstrate that this is the common pathological condition of many cases of gastric neuroses which have not been relieved by posterior gastroenterostomy and which may be relieved by duodeno-jejunostomy.

I find that I have failed to mention the very comprehensive review of Lewis A. Conner of New York (Amer Jour of the Med Sciences March 1907 vol cxxxix p 345) who reports an observation of his own and makes a critical analysis of 102 cases recorded in the literature. In this series there was no example of the complication following operations on the stomach itself. Two are recorded among my observations—Foley's pyloroplasty and one from the literature. Stomach peristalsis as observed in my first case according to Conner has been noted in only three of the 102 observations. Conner's bibliography is complete up to date.

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TUBERCULOSIS OF THE CÆCUM

WITH A REPORT OF TWO CASES

BY CHARLES GREENE CUMSTON M D

OF BOSTON MASS

FROM the pathologic view point tuberculosis of the cæcum may be divided into three forms as follows (1) the ulcerating form (2) the entero-peritoneal form and (3) the hypertrophic form

The ulcerating form represents the ordinary intestinal tuberculosis and like all parts of the intestine the cæcum may present ulcerations of a tuberculous nature When arising from an intestinal tuberculosis the ulcerations become localized more particularly in the terminal portion of the ileum where they may remain without extending beyond the ileo-cæcal valve but they may also invade the mucosa of the cæcum In the large majority of cases tuberculous ulcerations are secondary and they undergo their evolution in patients presenting pulmonary lesions They may occasionally be primary but under these circumstances they are much more localized and in one case reported by Jaboulay the lesion was localized on the posterior aspect of the cæcum The ulcerations appear more commonly in the closed follicles and Peyer's patches In shape they may be either oval or circular while their long axis is perpendicular with the axis of the intestine Less frequently tuberculous ulcerations primarily arise in the cæcum and from there extend to the ileum but however this may be whether the localization is primary or secondary in the cæcum these ulcerations never form stenoses sufficiently narrow to prevent the feces from passing Fibrous tuberculosis giving rise to stenosis is frequently encountered in the small intestine but is probably never met with in the large intestine and the cæcum in particular

Although it has been upheld that cicatricial tissue arising from tuberculosis and producing stenosis may possibly occur in

the cæcum we can hardly admit such a conclusion, because, in point of fact, the small gut is not comparable to the large intestine and what may happen in the former cannot occur in the latter. The calibre of the large intestine is notably greater than that of the small, so that cicatricial bands and annular stenoses which may, in the small intestine, arrest the progress of the feces cannot arise in the large intestine unless in the form of incomplete diaphragms incapable at any rate of being a serious obstacle to the onward passage of the feces.

The entero-peritoneal form of intestinal tuberculosis is represented by a complete involvement of the cæcum, the terminal portion of the ileum, with involvement of the mesentery and its lymphatic glands. The ulcerations of the mucosa extend in depth, burrowing through the intestinal layers and opening in the peritoneum, which structure itself is also involved in the process. Riddled with tuberculous granulations, it is covered with lymphnodes undergoing degeneration and the formation of multiple abscesses, while numerous strong adhesions are formed between the gut and the neighboring viscera. They frequently unite the cæcum to the posterior wall and the ureter and blood vessels are included in this tuberculous mass, so that, if an attempt is made to resect the neoplasm, there is considerable likelihood of injuring these organs, so that in one instance, Czerny wounded the ureter and was obliged to do a nephrectomy. The abscesses scattered throughout the large tumor formed by the intestine and the mesentery have a tendency to increase in size, they project and burrow towards the exterior and where this is going on the integuments become red and thin, so that finally the purulent pocket opens outwards by way of a more or less tortuous and fungous fistula. As has been pointed out the intestine itself communicates with the abscess from the progress of the ulcerated process so that a solution of continuity between the lumen of the gut and the skin takes place and a fecal fistula is thus created.

These fistulæ usually open either in the anterior abdominal wall, at the umbilicus, the cæcal region, or, which is more fre-

quent in the right iliac fossa even in those cases where the cæcal region is invaded. Occasionally they may open into the intestine (colon or small intestine) thus creating spontaneous entero-anastomoses. Then again the orifice of the fistule may be at some distance from the lesion such as in the lumbar region. And lastly the suppurative process may become directed towards the pelvis project into the vagina and thus simulate a pelvic collection.

The hypertrophic form of intestinal tuberculosis may truly be called the surgical type and for this reason more detail will here be given. Hypertrophic tuberculosis of the cæcum is usually primary. I might say always if one were permitted an absolute affirmation in medicine. Primary tubercles are at the present time thoroughly demonstrated to exist particularly for the bones and joints and the intestine may also be primarily attacked the cæcum in particular. There is probably not a single operator who does not recall tuberculous lesions of the cæcum undergoing their evolution independently of any pulmonary lesion with the general condition of the patient frequently intact or only somewhat weakened from the fact of the intestinal lesion which does not even appear to reach the peritoneum. After a radical or merely a palliative operation every trace of the process disappears and these patients become well without any pulmonary manifestations occurring just as is the case of tuberculosis of the skeleton.

Hypertrophic tuberculosis of the cæcum is primary and may perhaps be said that if in a patient tuberculous lesions of the lung are encountered at the same time as those of the cæcum the *latter being of the hypertrophic form* the lung involvement is the result and not the cause of the process in the intestine. In a case recorded by Caussade and Charrier the patient presented in the beginning gastro-intestinal symptoms with a tumor in the right iliac fossa without any stethoscopic evidence but two years later he had beside the intestinal disturbances pulmonary lesions. Consequently in this case the cæcum was the primary point of infection. Clinically speaking when a pulmonary phthisis gives rise to localizations in

the intestine, the result is an ulcerating process and not hypertrophic tuberculosis

It is a fact that hypertrophic tuberculosis is rarely in the small intestine, its points of election being the cæcum, the angles of the colon and, lastly, the rectum

Tuberculosis of the cæcum begins in the neighborhood of the ileo-cæcal valve. It was thought formerly that the terminal portion of the ileum was involved at the same time as the cæcum or before the latter, but, at the present time, this is no longer admitted. In the large majority of cases, hypertrophic tuberculosis commences in the cæcum, remains there and has no tendency to invade the ileum, and, although formerly many cases were published where the ileum was involved, it was because that, although the hypertrophic tuberculosis in the commencement remained limited to the cæcum, it in the course of time acquired a greater malignancy, so that to the hypertrophy of the walls of the gut ulcerations of the mucosa became added, and then only, the tuberculous process involved the ileo-cæcal valve and became propagated to the terminal portion of the ileum. Consequently, it is not the hypertrophic tuberculosis which becomes generalized to the ileum, but one is in reality dealing with a secondary tuberculous ulcerative process.

In many cases the mucosa of the hypertrophied cæcum has been found healthy, without ulcerations, while the ileum in no way participated in the process, its walls having retained their normal thickness. In other instances more or less extensive ulcerations in the cæcum have been noted, but the ileum has not as yet become invaded. And lastly, in other cases the ileum participated in the process and the mucosa of both the cæcum and ileum has been found covered with numerous, and occasionally very extensive, ulcerations.

Now, although the extension of the disease does not generally tend towards the ileum, the same cannot be said in the other sense, because hypertrophic tuberculosis may invade the ascending and the transverse colon and even extend still further. In one of Dieulafoy's cases the thickening extended to the hepatic flexure, while in a case recorded by Roux, he

was obliged to remove the cæcum ascending colon and a portion of the transverse colon. In an autopsy reported by Pilliet and Hartmann in a case of Bezançon and Lapointe the entire large intestine as far as the sigmoid flexure was involved in the hypertrophic process. To sum up it may be said that hypertrophic tuberculosis of the cæcum takes a descending course that is to say towards the colon.

In some instances the neoplasm only occupies a portion of the cæcum. Two such cases have been recorded by Richelot in one the tumor being situated on the posterior aspect of the cæcum and having the dimensions of a fifty cent piece while in the second case it occupied the ileo-cæcal angle. Cases of this kind are rather the exception and massive hypertrophy of the cæcum is the rule. The tumor presents a bossed aspect recalling that of carcinoma it is hard and in size may vary from a tangerine orange to two fists. Far from producing tuberculous ulcerations of the gut or a thinning of its walls as in other varieties of intestinal tuberculous ulcerations this particular form is characterized by a marked thickening of the various layers and the formation of a sclerotic lipomatous mass around the cæcum which is very resisting to the feel and easily brings to one's mind the idea of a malignant neoplasm.

This sclerotic lipomatous mass is exactly similar to that surrounding tuberculous kidneys or bladders and is the result of a defensive process for the limitation of the infection. It forms an integral part of the tumor and is even with difficulty separated from it especially in certain portions and more particularly in the neighborhood of the ileo-cæcal valve at which point there is a complete union between the intestinal layers and the pericæcal lipomatous atmosphere. In the midst of this sclerotic lipomatous tissue will be found the hypertrophied cæcum. The hypertrophy is never the same at all parts and may even vary very greatly. All the layers of the cæcum are involved in the hypertrophic process but most unequally and Dieulafoy has rightly said that all the layers are thickened but the hypertrophy is more particularly marked in the subperitoneal cellulo-fibrous and in the submucous layers. For

convenience sake, and with all due correctness, it may be said that the submucous and subserous layers form more than four-fifths of the neoplasm

As a consequence of the hypertrophy of the walls of the gut a stricture in the lumen of the cæcum may result. The calibre of this organ may be considerably diminished, the ileo-cæcal valve almost completely occluded, but in every case one is dealing with a neoplastic stenosis and not one of the cicatricial type. Occasionally one has observed an ampullar dilatation of the cæcum instead of a stricture of its lumen, which has caused Dieulafoy to say that there exists a concentric hypertrophy with stricture and an eccentric hypertrophy with dilatation of the cæcum.

Microscopically much of interest is to be found. The mucosa participates in the hypertrophy. No ulcerations may be present and this is particularly the case in the early part of the process. Later on, the submucous cheesy tubercles may open at the surface, destroying the mucosa in certain areas and thus give rise to ulcerations which, occasionally, may occupy the larger portion of the cavity of the cæcum. Beside these ulcerations verrucose or polypous projections will be found on the mucosa and opaque white points which are very distinct and represent the caseous foci developed in the dermis of the mucosa. These points may, of course, be wanting.

The submucous layer is the structure where the primary localization of hypertrophic tuberculosis takes place. The disease begins in the lymphoid organs, the follicles and Peyer's patches, because tuberculosis of the cæcum is above all a *lymphatic tuberculosis*. The thickened submucous layer microscopically shows an unequal portion of inflammatory and tuberculous elements. It is in the midst of a collection of small round embryonal cells, generally mononuclear and with a small amount of protoplasm, in other words, inflammatory cells, which, not infrequently, give rise to mistaken diagnosis of lympho-sarcoma, where are to be found the tuberculous follicles scattered here and there. The latter are in more or less

numbers having either a tendency towards sclerosis or caseation according to the evolution of the affection

The muscular layer participates but little in the hypertrophy it is infiltrated and its muscular fibres are dissociated by masses of inflammatory cells but they are not increased in number

The subserous layer is greatly hypertrophied and here again one meets with a very unequal mixture of tuberculous and inflammatory elements The tuberculous follicles are generally larger than those met with in the neighborhood of the lymphatic organs As in the submucosa these follicles may take on a sclerous or caseous evolution according to the type of the affection but as in its commencement hypertrophic tuberculosis is benign with a slow progression a sclerous evolution is the more frequent

To sum up one may define hypertrophic tuberculosis of the cæcum as the result of a battle between the inflammatory and tuberculous elements and taking place in the structures of the cæcum particularly rich in lymphoid tissue

The result of this battle is that in the commencement and for a long time the tuberculous lesions are few in number and it may even happen that they completely disappear in which case the inflammatory elements have conquered and choked the nascent tuberculosis so that microscopically nothing is seen in the tumor but inflammatory cells without any trace of tuberculous elements

Hypertrophic tuberculosis does not merely remain localized in the walls of the intestine because it involves the neighboring lymphnodes particularly those of the ileo-cæcal angle Occasionally this lymphatic tuberculosis may extend for some distance from the primary lesion and it has been known to reach the neighborhood of the diaphragm or extend along the aorta up to the pancreas

In the majority of cases the ileo-cæcal valve will be found hidden in a cicatricial mass it being retracted indurated thickened and superficially involved in an ulcerative process with polypoid vegetations here and there Its indurated orifice may

be considerably narrowed, while in other cases the orifice of the valve may be obstructed by the tuberculous neoplasm, this occurring in one of my cases, which may be summed up briefly as follows

The examination of the cæcum after resection showed that in its interior there was an irregular tumor planted on the upper aspect of the ileocæcal valve, it having a cauliflower structure and its size being that of a small apple. It obstructed the lumen of the valve completely and macroscopically closely resembled a carcinoma. The terminal portion of the ileum was dilated and somewhat thickened by a submucous infiltration. For about five centimetres beyond the cæcum the colon was also thickened, although no lesion of its mucosa was observed. The peritoneum and appendix appeared healthy and there were only three small lymphatic glands in the mesentery. Microscopical examination of the cæcum with a high power showed that the process was tuberculous. The patient, a female, 87 years of age, was seen in consultation with Dr Dalton, formerly of Cambridge, who gave me the following history. She had complained of pain in the right iliac region for about eighteen months. This was a painful sensation with periods of increase usually occurring a few hours after eating and by and by this became so marked that the patient restricted her diet. The stools were infrequent, requiring purgatives and the patient was rapidly losing flesh.

I saw the patient during an attack of colicky pain, so that we were obliged to resort to examination under an anæsthetic. The abdomen was not greatly distended and by bi-manual palpation nothing pathologic was found in either the uterus or its adnexa. However, at about the situation of McBurney's point, or a little higher, a hard, rounded tumor could be felt, which was fairly movable transversely. To the hand it felt about the size of a large orange and did not appear to be adherent either to the deeper structures, or to the abdominal wall. The other abdominal organs, as well as the thoracic viscera gave no evidence of any pathologic process. There was little or no elevation of temperature in the evening and the pulse, of good quality, was 88.

Given the patient's general condition and the history of the case, I was inclined to believe that one was dealing with a carcinoma of the cæcum and operation was advised. An incision in

the right semi lunar line was made and exposed a greatly enlarged and indurated cæcum covered by an apparently intact peritoneum. On account of the extreme mobility of the neoplasm resection of the cæcum was undertaken 8 centimetres of the ileum and 6 of the ascending colon being removed along with the cæcum. The ends of the large and small intestine were then closed by a through and through hemostatic suture of linen thread this being buried by a superficial row of continuous Lembert's suture with fine chromic gut. After this lateral anastomosis of the ileum with the ascending colon was easily accomplished. The patient made an uneventful recovery having a natural motion two days after the operation and left the hospital on the 20th day in excellent condition. She was seen nineteen months after the operation for the last time when she was found to have considerably gained in weight and was in apparent good health.

As to the condition of the appendix found in tuberculosis of the cæcum it may be said that as in the case of the ileum it does not in the beginning participate in the process but later on when the lesion has become extensive and ulceration has been added to the hypertrophic mass the appendix may in its turn become involved and form an integral part of the neoplasm. In certain cases it may be completely lost to view being imbedded in the sclerous pericæcal mass.

Referring now to the symptomatology it may be said that tuberculosis of the cæcum commences slowly sometimes arising in an otherwise perfectly healthy patient or on the contrary in one already predisposed by some local or general affection such as gastro-enteritis typhoid fever dysentery etc. It makes itself manifest in the first place by abdominal pain and intestinal disturbances. The latter consist in alternating diarrhoea and constipation while the abdominal pain appears in the form of violent colics localized in the region of the cæcum. The attacks of colic may be of very short duration rarely extending over twenty four hours after which they subside leaving some sensitiveness in the abdomen which is particularly evident in the right iliac fossa.

Constipation may be the only symptom when the affection

results in a stricture of the ileo-cæcal valve, or by obstruction of the latter by the tumor, as in the case above reported. Occasionally, the disease may commence suddenly with phenomena of circumscribed peritonitis.

After a few months, or a year or two, according to the rapidity of the evolution of the process, the lesions oblige the patient to seek surgical relief. If a suppurating perityphlitis has supervened one or several fistulæ will be found in the region of the right groin. The pus may also burrow down towards the small pelvis and reach the ischio-rectal fossa and make its exit at the side of the anus.

By palpation a tumor in the right iliac fossa will usually be discovered. A hard, resisting mass, with an unequal surface, and having a cylindrical form, will be made out, although, in many reported cases, including my own, the growth was distinctly oval in shape. In size the neoplasm will vary from that of a walnut to an orange, or even more and if not adherent to the abdominal wall, the latter will remain smooth to the feel, while the growth will slide over the deep structures. When the tumor is adherent to the viscera contained in the iliac fossa its mobility will be more evident in a transversal direction. If there is only a tumefaction, simply giving the sensation of an indurated abdominal plaque, one would be more likely to suspect an aggravated form of appendicitis and here the diagnosis is frequently extremely difficult.

On percussion the neoplasm will usually present an area of dullness in its centre. If fistulous tracts are present, they should be prudently explored in order to ascertain their length and direction. The lymphnodes of the right inguinal region are sometimes enlarged and it is usually impossible to distinguish them apart from the tumor, or the mass formed by the enlarged glands of the iliac fossa which constitute an indurated mass which is lost in the depth of the lumbar region. One should carefully search for other localizations of tuberculosis, because these patients may already have slight lesions in the lungs or other viscera.

The functional symptoms are merely an exaggerated form

of those met with in the commencement of the disease the pain becomes more persistent and the digestive disturbances more marked. If the process takes on an obstructive type with a rapid evolution the periods of constipation may be extremely prolonged and may last a week or more. The patient suffers in the right iliac fossa a few hours after eating a symptom also very pathognomonic of carcinoma of the cæcum as I pointed out several years ago in my paper on this affection written in collaboration with Dr Vander Veer¹. One also meets with attacks of vomiting the matter voided occasionally having a peculiar odor although never fecaloid. This is due to the stagnation of the food in a dilated stomach a condition not infrequently observed in patients afflicted with chronic affections of the cæcum. Indican may be present in the urine as in all cases where fermentation is occurring in the intestine.

The general condition may remain very satisfactory for a considerable length of time but finally loss of appetite and strength occur and the patient takes on a waxy look. There may or may not be a rise in temperature but when this does occur it is apt to indicate a focus of tuberculosis in the lungs.

The hypertrophic type of tuberculosis of the cæcum affects the clinical aspects of a malignant neoplasm and as I have already pointed out it resembles closely carcinoma. The principal characters of this form are the development of a tumor in the right iliac fossa whose increase in growth ordinarily slow but occasionally quite rapid is accompanied by pain in the form of short but very violent attacks of colic. It may also be characterized by evidences of intestinal occlusion accompanied by vomiting which although of an alimentary nature may as we have pointed out have a peculiarly fetid odor. Complete intestinal occlusion has been met with although very infrequently.

The ulcerating form simulates pure and simple inflammation of the cæcum and its appendix and usually no tumor is present but a diffuse infiltration or a simple tumefaction may be made out. When the lesions extend to the appendix a small

tumor may be discovered. The abdomen is distended while constipation and vomiting are not infrequent. In the more advanced phase chills and fever appear, indicating the formation of pus in the iliac fossa.

After a period of chronicity, interspersed with acute phenomena, which varies from months to years, the development of the lesions may cease by an appropriate medical treatment or else the symptoms may increase in intensity, the general nutrition becoming less and less, so that the patient dies from inanition as in any other tumor obstructing the intestine. Death may result from tuberculous peritonitis, while if the lungs become involved the patient dies from tuberculous cachexia.

Other serious complications bringing about a fatal outcome, such as perforation from ulceration of the intestines, or a fecal abscess arising in the cellular tissue of the iliac fossa are to be feared. If the affection evolves towards a cure, a very serious stenosis may result like any following an ulcerating intestinal lesion from the resulting cicatrix. A right-sided pleurisy is frequently an excellent diagnostic indication, and I would also mention an instance of hydronephrosis resulting from compression of the ureter by the cæcal neoplasm.

In making a differential diagnosis one of three conditions may be present, namely, (1) there is a tumor, (2) there is no tumor, but a diffuse infiltration of the right iliac fossa is detected, (3) one or several fistulæ are present in the right iliac fossa.

If the tumor is due to an accumulation of feces the galvanic current and purgation will settle the question, but, if after these means, the tumor is still felt, carcinoma of the cæcum is what usually first comes to one's mind. In both tuberculosis and carcinoma of the cæcum, especially when the former lesion is somewhat advanced, the patients present a waxy look, there is loss of flesh, while the shape of the growth, being oftentimes cylindrical and elongated in a vertical direction, adds greatly to the obscurity of the diagnosis, but what is still more perplexing is the prolonged constipation, an indication of chronic intestinal obstruction, involvement of the lymphatics

in the right groin and absence of a rise in temperature and frequently when the growth is examined after removal there is difficulty in coming to a correct differential diagnosis between tuberculosis and carcinoma.

As differential signs it may be mentioned that the hypertrophy is far more rapid in a case of carcinoma likewise the secondary involvement of the mesenteric glands while in tuberculosis the surface of the neoplasm is less bossed. Of course, these differences are in reality of very slight importance. At a more advanced phase the tumor softens the skin becomes red and thin and adheres to the underlying structures. When the period of suppuration is reached when by one or several fistulæ pus is given exit the bacteriological examination of the latter with animal inoculation allows one to come to a correct diagnosis but which at this advanced stage of the process is of little use.

To sum up it may be said that the long duration of the disease the greater frequency of spontaneous or provoked pain the relatively young age of the patients the presence of Koch's bacilli in the stools will greatly aid in making the diagnosis of tuberculosis of the cæcum. On the other hand intestinal lymphadenoma chronic adenitis of the iliac glands movable kidney and actinomycosis are more easy of differentiation. In the female the diagnosis is rendered difficult between appendicitis or suppurating lesions of the adnexa but from this short consideration of the symptomatology is to be particularly pointed out the great difficulty of differential diagnosis between carcinoma and tuberculosis of the cæcum and secondly the occasional impossibility to precisely determine whether one is dealing with a tuberculosis of the cæcum involving the appendix or a simple chronic relapsing appendicitis.

When the tuberculous process is distinctly limited to a portion of the cæcum a partial resection of the organ may be undertaken upon the condition that the intestinal calibre will not suffer from removal of a portion of the organ. If the resection to be of any curative value must be extensive so that a stricture of the gut might be the consequence complete

removal of the ileo-cæcal segment should be undertaken. When the process has involved the precæcal glands, they should be removed, or if their extirpation is rendered impossible on account of extensive adhesions with the intestinal wall, they should be incised and curetted.

A tuberculosis of the ileo-cæcal region without tumor formation and giving rise to fistulæ requires the same treatment as tuberculosis with a neoplastic formation, viz, bilateral exclusion of the diseased segment. If a general peritonitis from perforation is present, laparotomy and search for the perforation may be attempted, but this is usually a very difficult undertaking.

As far as the results of exclusion of the intestine are concerned, it may be said that they are usually quite satisfactory. This interference has been resorted to in cases of cæcal tuberculosis without fistulæ. In Ulmann's case, after bilateral exclusion with an iliac anus from the colon, there was a considerable decrease in size of the growth, while in Frank's case, in which bilateral exclusion with suture of both the small and large gut to the skin, the tumor had entirely disappeared seven years after the operation. There was only a slight prolapsus of the mucosa of the colon with a trifling amount of mucous discharge, the opening of the ileum having become almost closed. In a case reported by Ewald and seen three years later, the opening into the small gut had entirely closed, while that of the colon presented a prolapse of the mucous membrane to a slight degree and only gave issue to a serous fluid requiring a new dressing once a fortnight. In other instances intestinal exclusion has, later on, allowed one to resect the diseased structures, which, at the time of the first interference, was considered impossible.

When fistulæ are present the ultimate results of exclusion have also been satisfactory. In Wiesinger's case, the result was a fistula which excreted a very small quantity of pus, while the neoplastic mass had decreased in size and there was a great improvement in the general condition of the patient. Albert's patient was seen three months after the operation, at which

time the pre existing fistula was found to have closed the growth was much smaller and since the operation the patient had increased ten pounds. A young boy operated on by Gnesia made weight rapidly after the operation while the tumor diminished in size and became movable. In Friedlander's case the patient increased 14 lbs in six weeks while Ricard's patient increased 36 lbs in three months after the operation the growth was diminishing and the fistula only gave issue to a small amount of serous fluid. These few instances are sufficient to show the benefit which may be derived by exclusion of the ileo cæcal segment while the operative mortality is small since out of 30 cases there were only two deaths directly due to the interference. However it may be said that resection of the cæcum is decidedly indicated in tuberculosis of the cæcum when the latter represents the hypertrophic type and as soon as a diagnosis is made surgical interference is at once demanded. Resection is absolutely indicated when there is a tumor without abscess formation or fistula and under these circumstances it is a radical operation because it removes the focus of tuberculosis from the body. If resection is found difficult or dangerous on account of extensive adhesions intestinal exclusion is then to be preferred.

Resection of the ileo-cæcal segment was easily carried out in my second case the patient being a woman 27 years of age and married for five years who was referred to me with a diagnosis of movable right kidney. She had had one child two years previously the labor having been perfectly normal. For the past eight months the patient had suffered from dyspeptic phenomena and frequent attacks of colicky pain. There was alternating constipation and diarrhoea. For the past two months there was a dull and constant pain in the right iliac fossa. Three weeks before coming under my observation the patient developed what appeared to be an inflammatory attack in the region of the cæcum accompanied by a rise in temperature tumefaction and constipation. The attending physician at this time diagnosed the case as one of appendicitis but as she rapidly recovered from the attack and as afterwards he could distinctly make out a fairly movable

tumor about the size of the kidney in the iliac fossa, he revised his diagnosis and considered it to be a movable kidney, which had become adherent in that region

The patient was pale and thin with the abdomen slightly distended. The constipation was still persistent, requiring an enema daily and from time to time she suffered from slight colic in the lower abdomen. A tumor the size of a mandarin orange could be felt distinctly in the right iliac fossa, it was movable, particularly transversely and slightly tender on pressure. Percussion did not reveal any dullness over its surface. A careful examination of the thoracic and abdominal viscera proved negative. The urine was normal.

Given the history of the case I was rather in favor of a diagnosis of tuberculosis of the cæcum, because, although the patient was quite thin, she did not present that characteristic aspect of cachexia, so often present in malignant disease of the gut. An operation was, therefore, advised.

An incision in the semi-lunar line exposed the peritoneal cavity and a few soft adhesions uniting the cæcum to the parietal peritoneum. These were broken down with ease and the cæcum was found fairly movable, so that it could be drawn out of the abdominal wound. It was greatly enlarged, the peritoneal surface somewhat injected, and by palpation its walls were found greatly thickened and at one point near the ileo-cæcal valve a tumor could be detected. Resection of the cæcum with three centimetres of the ileum and three of the colon was quickly accomplished and end to end anastomosis with linen thread was easily done. A small cigarette drain was inserted and abdominal walls closed by three layers of sutures. Recovery was uneventful, the patient having a spontaneous motion on the third day after the operation and she was able to return to her home in seventeen days. The drain was removed on the second day and the small opening left in the abdominal wall after its removal closed in a few days.

Examination of the cæcum after removal showed that all its walls were thickened and that in the region of the ileo-cæcal valve this thickening had attained the thickness of seven centimetres and which during the operation on palpation of the organ had given the impression of a neoplasm. A careful examination of the abdominal cavity did not reveal any enlarged lymphnodes.

in the mesentery or elsewhere. Microscopical examination of the cæcum showed numerous giant cells in its walls and points of caseation so that the anatomical diagnosis was tuberculosis of the cæcum.

If a patient should present a limited focus of tuberculosis in one lung I believe that this is not the contra indication for radical interference on the cæcal lesion because the latter is a serious hindrance to forced feeding and when the process is removed there will probably be a return to the normal in the digestive functions which can only have as a result a happy influence on the general condition thus indirectly improving the lung lesion. Acute postoperative pulmonary lesions are infrequent but if an extensive pulmonary infiltration is present accompanied by an evening rise in temperature, night sweats and a rapid loss of flesh any operation on the intestine is contraindicated. This also applies when frequent and tenacious diarrhoea is present (indicating a diffusion of the lesions in the intestinal mucosa) while a marked albuminuria indicating a tuberculous nephritis is also a contra indication.

STRANGULATION RESULTING FROM DISTENTION OF HOLLOW VISCERA

ITS BEARING UPON APPENDICITIS, STRANGULATED HERNIA AND
GALL-BLADDER DISEASE.

BY CORNELIUS VAN ZWALENBURG, M D,
OF RIVERSIDE, CAL.

SEVERAL times during the past four years I have made the assertion that distention of the appendix back of an obstruction in any part of its lumen would interfere with its circulation even to the point of arresting it entirely

The following experiments upon dogs were undertaken to demonstrate this fact

The placing of an electric light bulb in the lumen of the appendix or the intestine made it possible to directly observe the circulation under the microscope and opened up a wonderfully interesting and inviting field for study

After proper etherization a loop of intestine was withdrawn through an abdominal incision, a canula tied into one end of it and a small electric lamp into the other The whole was then brought under the microscope and the circulation in the wall of the gut studied under different pressures by water introduced through the canula The degree of pressure was noted on a mercury manometer, placed in circuit with the pressure bulb The same experiment was done on the appendix and the same results obtained

The following are the principal observations as they relate to this study

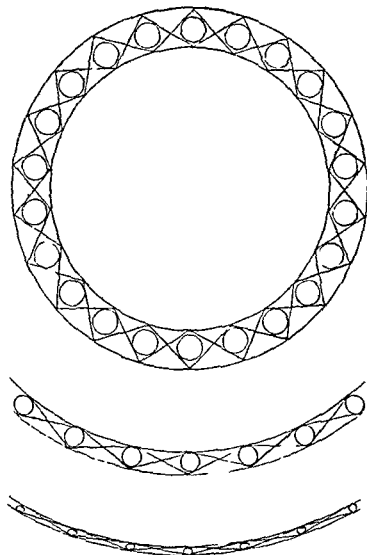
At 30 millimeters mercury pressure we found that some capillary streams were arrested

At 60 mm many small veins had their currents arrested, and in most of them the stream was so slow that individual corpuscles could be seen

At 90 mm a most interesting study presented itself All blood streams were moving slowly and many were not moving at all One was impressed with the difficulties encountered by the circulation in its attempt to find some point of least resistance through which the stream might insinuate

itself. Currents would at one time go in one direction and the next moment in the opposite. At the point of branching of vessels streams were seen going in all sorts of directions.

F. G.



Sch. mat. rep. es. stati. f. tri. ti. f. th. blood. es. l. i. th. wall. f. dist. d. d. i. test. o. ppe. dix. () N. rm. l. (s) Mod. rat. ly. dist. ded. () F. lly. d. tended. Th. t. nset. es. l. th. th. i. g. wall. blot. t. th. pace. f. blood. es. l.

At 130 mm. all circulation had ceased—the corpuscles standing still in the blood vessels. Many vessels however still carried the impulse of the heart beat—the corpuscles moving to and fro but retaining their relative

positions in the field This pulsation was seen in some of the largest and the most superficial arteries after the pressure was carried up to 250 mm (Fig 1)

Some ecchymotic hæmorrhages were noted as early as 50 mm

Gut kept at 80 to 90 mm pressure for an hour was enormously "congested," that is, the apparent number of veins seen on the serous surface was greatly increased and their caliber was also greatly increased

Evidently there was great damming back against the aggressive high pressure in the arteries and, in its effort to find exit into the open veins beyond, the stream had been forced into many unfrequented paths

Pulsation in the veins was noted frequently at the comparatively lower pressures and constantly at high pressures, illustrating the fact that capillary and venous pressures are relative—being the result of the arterial impulse as resisted by the obstruction to the venous return The more firmly the column of blood is held the more directly and positively the impulse is carried

That effusion accompanies such obstruction and congestion is so obvious from daily clinical observation that I shall not stop to discuss it here Enough to say that drops of fluid were observed standing upon the surface of the gut like beads of perspiration When we remember how quickly exposed peritoneal surfaces become dry and note that the exposure in this case was open to the dry air of Southern California the evidence of effusion becomes still more conclusive

The demonstration seems complete that distention of gut (or of other hollow viscera) interferes with the circulation in its walls, and allows infiltration and effusion to take place into its walls and lumen and any other open space which may come within its influence

The return circulation is retarded at comparatively slight pressures Effusion follows, as in all obstructions to venous flow As the average venous pressures in the intestines under ordinary circumstances probably varies from 4 to 10 mm mercury, any pressure beyond that will offer some resistance to the return current Tiegerstedt (Text-book on Physiology) gives pressures in a number of veins corroborating these

figures This effusion into the tissues of the walls and into the lumen of the gut increases the distention When the distention reaches the point where it produces a pressure in the intestine equal to that in the arteries circulation is entirely arrested

This mechanical interference with the circulation explains a number of surgical conditions

In the early pathology of acute appendicitis it is responsible for most of the initial changes

In connection with the roll of the ball valve in the etiology of appendicitis I have discussed it in *So Cal Practitioner* Sept 1903 *Jour Am Med Association* March 26 1904 and in the *ANNALS OF SURGERY* March 1905

Acute appendicitis always finds a constricted or kinked appendix Fecal matter whether in the form of a concretion or not lodges behind this constriction forming a ball valve Secretion behind the obstruction soon produces some distention and pressure upon the circulation This means effusion and more pressure and the vicious circle is established Effusion and pressure mean infection as soon as resistance is sufficiently lowered by interference with the blood supply and the minute traumatism and ecchymotic hemorrhages have made the entrance of germs sufficiently easy

If the plug is fortunately driven out early through the constriction by the rising pressure the ensuing inflammation may be very slight But if it remains the lumen of the appendix beyond the constriction becomes a veritable abscess cavity and pressure continuing to rise necrosis or gangrene of the wall is certain to follow

In strangulated hernia it is a very important consideration The first step in the process is just enough obstruction at the ring to prevent the easy return of the hernial mass which has been crowded into the sac with perhaps more than its accustomed abdominal pressure This obstruction is sufficient to retard the venous circulation This results in effusion into the sac and into the incarcerated gut or any other organ which may be present

This effusion increases the pressure in the sac and con

tents, and continues until the height of the arterial pressure is reached when obviously no more fluid can be pumped into it and strangulation is complete

Any gut present in the sac will suffer the greatest injury on account of the pathogenic germs, always present, attacking the tissues as soon as the resistance is sufficiently lowered by the poor blood supply to allow infection to take place

In the gall-bladder it often determines the pathological condition. From this cause, in a distended gall-bladder, with an obstructed cystic duct *in the presence of germs* to produce the infection, empyema or gangrene will result. The firmness of the gall-bladder wall offers much greater protection to its circulation than does the intestine, or the appendix, nor is *complete* obstruction so common—the concretion does not commonly form in the very mouth of the duct as it does in the appendix and consequently does not make such a perfect ball valve

In common duct obstruction infection is much less likely to take place because of the ability of the liver to take up fluids from the bile ducts and thus to keep down the pressure

The question has often presented itself to me whether this same circulatory interference were not an important factor in gastritis and in ulcer of the stomach. It is conceivable that a heavily loaded stomach might have sufficient interference with its two exits, the œsophagus and the pylorus—to allow sufficient distention to take place to materially interfere with the circulation in the walls of the stomach, particularly the mucosa

Minute traumatisms and ecchymotic hemorrhages which are early features of this distention should receive due consideration in this connection

In all abscesses this effusion and pressure upon blood vessels is very marked. The location of the most vulnerable blood vessels in the abscess wall being the first to succumb, determines the direction in which the pus will burrow

Thus is explained the greater likelihood of an abdominal abscess rupturing into the bowel than anywhere else

If a considerable surface of gut goes to make up a part

of the wall of an abscess the blood vessels in that wall will have only the thin membrane like intestinal wall to protect them from pressure. There is no possibility of their being backed up behind by exudate as that is a mucous surface.

As the abscess wall is put upon the stretch the effect upon the intestinal blood vessels is the same that it is when the pressure is from within the gut. By stretching all interstices in the wall are blotted out and circulation is out of the question. The effect is the same as the steady pull upon the broad ligament when operating in the pelvis. As long as it is kept taut there is no bleeding but when this tension is relaxed the blood vessels reopen and hemorrhage appears.

The vessels in the abdominal wall for instance have thick cushions of tissue to resist this stretching and consequent obliteration with many blood vessels to reinforce those in the abscess wall.

With the help of the ubiquitous omentum the peritoneal exudate which makes so large a proportion of the wall of abdominal abscesses can go on indefinitely backing up with more exudate to take the place of the gradual necrosis going on at the front.

Many other conditions which are affected by this circulatory disturbance from distention might be discussed. This is not an attempt at making this an exhaustive catalogue. I will only suggest for consideration the following.

Intestinal distention in typhoid fever with its greater danger of perforating ulcers and hemorrhage. Its importance in all forms of ileus only casually suggested by Kocher¹ but really one of the greatest factors in the multiform pathology of that condition. Intra-cranial pressures so beautifully demonstrated by Cushing. Overdistentions in the urinary tracts bladder ureters and kidneys. Effusions into joints with or without pathogenic germs being present. Fluids in tumors. And even in excessive uterine distention in pregnancy.

Ueber Ileus Mitth. aus der Grenzgebieten der Medizin und Chirurgie
vol. iv 1899

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this mechanical burden upon the circulation should be given due consideration

In the past few years much work has been done upon absolute pressures in the blood vessels, but outside of these there is still a wide field for investigation. The hydraulics of the body are worthy of much greater prominence than have been given them.

I wish to express my obligations to Dr Geo E Tucker of Riverside, Cal., and to Dr Haven Emerson, of New York City, for their valuable assistance and helpful suggestions.

ABNORMAL ILEO APPENDICULAR FOLD AS A CAUSE OF PARTIAL OCCLUSION OF THE BOWEL

BY C HAMILTON WHITEFORD M.R.C.S. L.R.C.P.

OF PLYMOUTH E.T.C.

A well preserved active man aged fifty two was sent to me by Dr R H Clay. For the last twenty years he had suffered from discomfort in the abdomen. For the last four years the discomfort had increased into intermittent colic.

When first seen in January 1906 the colic although of daily occurrence was not of sufficient severity to make his life a burden. Operation was therefore not advised.

When seen again in November 1906 the colic although somewhat less frequent had become much more severe. The attacks of pain most intense in the region of the umbilicus now lasted several hours and were often relieved by muscular exercise or pressure on the abdomen.

In the last nine months the patient had lost in weight ten pounds. He has been living chiefly on milk. Constipation is habitual. He is never sick. Except for the colic he is in good health. He has never had jaundice or any abdominal illness.

The abdomen was slightly distended and resonant especially below the umbilicus. Gurgling in the right iliac fossa can always be elicited on palpation.

No peristalsis visible. No history of any abdominal tumor during the attacks of colic. Nil abnormal felt.

Per Rectum Nothing abnormal to be felt.

Urine Acid. Nil abnormal.

The patient feels that he cannot go on in his present condition of repeated severe pain.

Diagnosis Partial obstruction of small intestine.

Operation On 4th November 1906 the abdomen was opened through the lower right rectus. The appendix was normal. The small intestine was empty (the result of purgatives and enemata) with one loop tied down to the right side of the pelvis. The bowel affected was the lower ileum which for three

inches from the ileocæcal junction upwards was anchored to the right pelvic brim by a fold of peritoneum, which resembled a second mesentery and contained well-marked blood vessels. This fold was attached at one end to the convex surface of the ileum, *i.e.*, exactly opposite to the attachment of the mesentery proper, for three inches. The other end of the fold was attached for two inches to the pelvic brim. The width of the fold from ileum to pelvic brim was one inch. Towards the right the fold was continuous with the meso-appendix and peritoneum of the iliac fossa. Towards the left the fold ended in a free edge.

The rest of the small intestine was absolutely normal, as were the other abdominal contents. There were no adhesions. The free border (*i.e.*, the left border) of the fold was divided for one and a half inches between catgut ligatures.

After History Seen on 21st February, 1907, the colic has disappeared, but, as might be expected, he is still at times troubled with "wind."

Comments—The fold of peritoneum angled the ileum in such a manner that, with moderate distension of the ileum, a kink would be formed sufficient to cause partial, or even complete occlusion of the lumen of the bowel. Why the symptoms commenced in middle life is not obvious.

The fold is an exaggerated form of the normal ileo-appendicular fold described by Moynihan on p. 88 of his book on "Retro-peritoneal Hernia." The following details are extracted from Moynihan's description.

"The fold extends from the lower border of the ileum—that directly opposite the line of the mesenteric attachment to the anterior surface of the meso-appendix. It is quadrilateral in outline. The upper border is attached to the ileum for an extent which is extremely variable. An average length would be between $1\frac{1}{2}$ to $2\frac{1}{2}$ inches."

"Its left or inner border is concave to the left and free. This edge contains the recurrent or ileo-appendicular artery, given off almost immediately below the level of the ileum from the main appendicular artery."

"The arteries are everywhere accompanied by veins."

"Between the two layers of peritoneum in the fold are also seen some muscular fibres."

"Luschka considered that this fold acted as a regulator between the ileum and cæcum, keeping a proper and advantageous relative position

for these viscera By means of this fold the assumption by the ileum of any extraordinary and vicious position is prevented

The fold in the above case differed from a normal fold in (1) being attached to the pelvic brim (2) its width measured between its attachments to the appendix and ileum being much less than usual

A NEW LIVER SUTURE.*

BY VAN BUREN KNOTT, M D,

OF SIOUX CITY IA

IN this brief paper I desire to present a form of liver suture, simple, easy of application and efficient as a means of securing approximation of the tissues as well as hemostasis. As it is the intention at this time to present merely a preliminary report which I hope to supplement later by an article dealing more exhaustively with the subject of liver surgery no general discussion of the subject will be attempted.

The surgery of the liver, with the exception of the gall bladder and ducts, has not advanced during the past decade as rapidly as has abdominal surgery in general and standing prominently in the foreground as chief among the reasons preventing such advance has been the fear of hemorrhage.

During the last few years many investigators have attempted to solve the problem and much time and ingenuity have been expended in the efforts to secure a suture which would effectually control hemorrhage and produce coaptation of the liver wound. Many of the methods reported have been most ingenious, but most of them have presented one or both of the following drawbacks. First, more or less difficulty of execution and the necessity for limiting the suture to a comparatively small area of liver tissue, second, the necessity for leaving behind in the peritoneal cavity some non-absorbable or slowly absorbable material forming part of the scheme of the suture.

Without further discussion of the methods hitherto published I shall describe a suture which experimentally has proven very satisfactory in my hands.

This suture will permit the coaptation of a wound of the liver substance at the same time controlling the hemorrhage

* Read before Iowa State Medical Society, May 17 1907

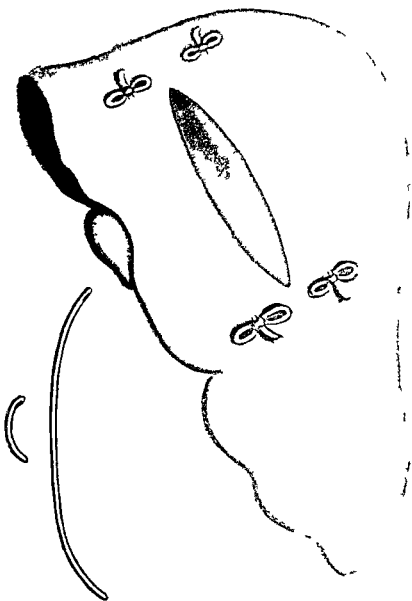
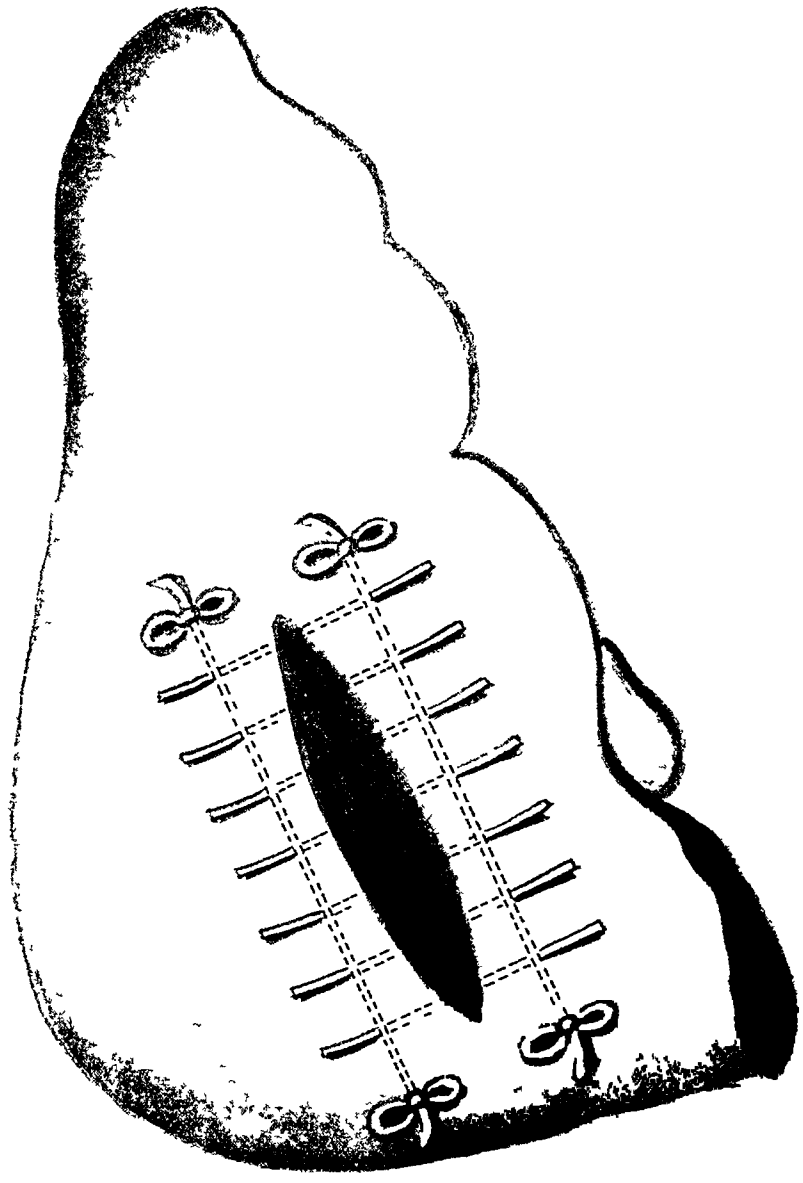
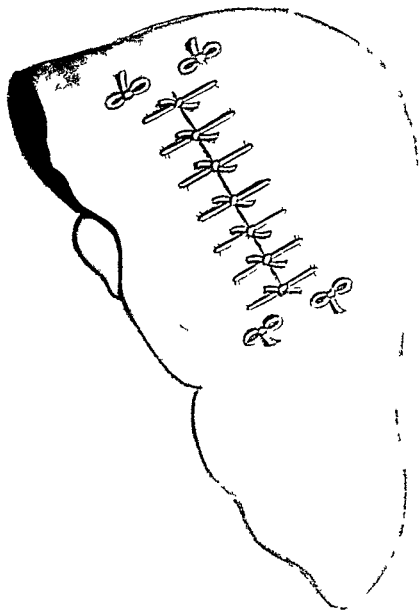
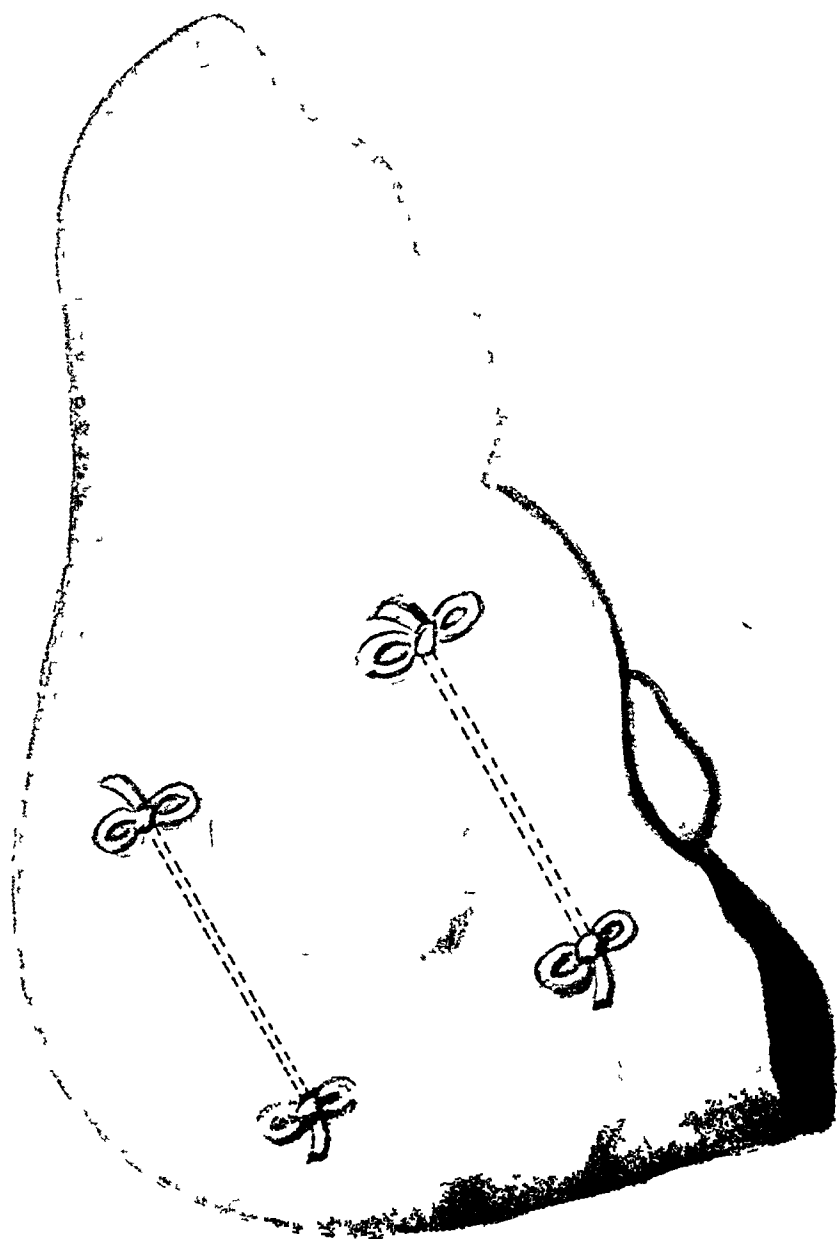


FIG 2



The transverse interrupted sutures introduced





Long pedicle sutures introduced as preliminary to the excision of a tumor from the liver

without the necessity for packing and will also permit the resection of large or small areas of tissue for the radical extirpation of liver tumors

Parallel with the wound in the liver or with the area to be excised and about one half inch from its edge upon either side insert deeply through the liver substance by means of a large round blunt needle shown in figure 1 a strand of No 3 catgut. These needles as well as the small blunt needle mentioned later are modifications of Kousnietzoff's liver needles which have been so successfully used and have proven very satisfactory. These strands should enter the liver tissue about one inch beyond the edge of the wound run deeply through the liver substance and emerge the same distance from the opposite end of the wound. The ends of these catgut strands are now fastened by drawing them up snugly and tying to either end of both strands a small ordinary skein of catgut which presenting a broad surface against the liver tissue prevents the indrawing of the suture ends. Transverse interrupted sutures (Fig 2) of No 3 catgut are now introduced by means of a small blunt needle also shown in Fig 1 in such a manner that they engage upon either side of the wound the buried long strand of catgut. These may be tied as rapidly as introduced and exerting their traction upon the buried long suture may be tied snugly (Fig 3) ensuring hemostasis and coaptation without the danger of their cutting out.

When it is desired to remove a portion of the liver tissue carrying with it a tumor this may be done by excising between the buried long sutures (Fig 4) a wedge shaped ellipse of liver substance and introducing the transverse sutures as above described.

Hemorrhage during this procedure may be controlled either by manual pressure or by elastic ligature until the transverse sutures are tied when it will immediately cease.

If desired any large veins presenting along the cut surface may be tied as recommended by Keen by placing a ligature about them with a small needle carrying fine catgut which precaution in my experimental work I have found unnecessary.

I have not yet had an opportunity to employ this suture upon the human being but should not hesitate to rely upon it at the first opportunity. In many experiments upon dogs I have found that it was possible to remove various amounts of liver tissue up to one half of the organ beyond which amount I have not tried to go and also that hemorrhage from any sort of a wound large or small in the liver substance could be in this manner easily controlled.

As the material used in this suture is plain catgut which having served its purpose will be absorbed the necessity for an open wound, gauze packing, etc., may in most cases be eliminated.

I do not offer this method as one that is perfect nor do I care to make any extravagant claims for it as my experience with it is as yet too limited. I offer it with the hope that as opportunity permits you will try it and demonstrate its value or its shortcomings.

THE OPERATIVE TREATMENT OF CALCULI IMPACTED IN THE PELVIC PORTION OF THE URETER

BY HUGH M RIGBY MS FRCS ENG

OF LONDON ENGLAND

Assistant Surgeon to the London Hospital Surgeon to the Poplar Infirmary Assistant

THE operative treatment of stones impacted in the lower portion of the ureter has of late received a good deal of attention During the last two years I have operated on several occasions at the London Hospital for the relief of this condition

An investigation of the literature of the subject shows that the surgical treatment of impacted stone in the pelvic portion of the ureter is a comparatively recent achievement

Fowler (in *Annals of Surgery* 1904 XL 943) gives a good account of the progress made in the operative treatment of these difficult cases He states that Bardenheuer in 1882 was the first to remove a stone from the upper part of the ureter by the iliac extraperitoneal route Even as late as 1898 the statement was made that stones impacted in the pelvic portion of the ureter were inaccessible to surgical treatment Hurry Fenwick (*Obscure Diseases of Kidney* 1903 p 151) however removed a stone from the juxtavesical part of the right ureter by the perineal route in 1895 In 1892 Cabot (*International Journal of Medical Sciences* No 103 p 43) suggested that stones so placed could be removed by a modified Kraske operation but the necessary severity of this procedure has condemned it as a routine method of treatment Further Henry Morris (*Surgical Diseases of Kidney and Ureter* 1901) showed that stones could be removed from this portion of the ureter in the female at any rate by a sacral route which did not involve any removal or division of the sacrum or coccyx

Several recent writers have proved that stones impacted even in the portion of the ureter between the pelvic wall and the wall of the bladder can be removed by the inguinal extraperi-

toneal route The difficulties of this operation however in a fat subject, and the fact that in the female the base of the broad ligament has to be encountered, are sufficient reasons for attempting some other means of access to this portion of the ureter In certain cases where local removal is impracticable, stones can be displaced upwards owing to dilatation of the ureter above the site of impaction and they can then be removed by the inguinal route

The extraction of a stone from the juxtavesical portion of the ureter has been carried out through the rectal wall on one occasion, the case was fatal and the operation is never likely to be repeated A successful case of removal of a stone from the pelvic portion of the ureter by a transperitoneal operation is reported by Stewart,⁵ but in the light of recent experience this route is no longer practised An extraperitoneal operation is the method of election in all cases owing to the great risk of leakage and peritoneal infection by the transperitoneal route

The writer of this article has exposed the ureter from below by a pararectal operation on four different occasions and has successfully removed stones in three of these cases In the fourth the ureter was exposed and thoroughly explored with a bougie from the kidney to the bladder, but the stone had probably been passed

Statistics of recorded cases show that the juxtavesical portion of the ureter or that portion between the pelvic wall and the bladder is a comparatively common site for impaction of a ureteral stone

Henry Morris (loc cit) in 45 cases found 19 within 2 inches of the bladder, 15 close to the vesical wall, 11 at the level of the brim of the true pelvis

Schenck⁶ in 1901 out of 84 cases, found that in 68 the site of impaction was stated as follows 19 within 6 centimetres of the kidney, 8 at or near the brim of the pelvis, 41 within 2 inches of the vesical opening, i.e., 50.6 per cent of these cases were in this position

Bovee⁷ collected 64 operations in which an impacted calculus was removed by the extraperitoneal route

In 57 of these cases 22 were found at the upper constriction 17 at the pelvic brim 18 close to the bladder wall

The operative treatment of stone impacted in the upper portions of the ureter need not be considered at length as on this point there is unanimity of opinion The portion of the ureter extending from the pelvis of the kidney down to the point where it leaves the lateral wall of the pelvis can be exposed with comparative ease by the lumbo ilio inguinal incision The peritoneum is raised up and the ureter which always adheres to this structure is defined In the male subject if not too fat the portion of ureter between the pelvic wall and bladder can also be exposed In a fat subject this may be very difficult and in the female impossible owing to the broad ligament In all cases when possible the stone should be displaced upwards and removed high up It is not always necessary to make the lumbar incision an inguinal incision as for exposing the external iliac vessels need only be employed Again there is little difference of opinion as to the methods of reaching stones impacted in the vesical orifice of the ureter or in the portion which traverses the bladder wall The object of this communication is to especially discuss the operative treatment of stones impacted in the so called juxtavesical portion of the ureter that is a portion about 3 inches in length which extends between the bladder wall and the ischium More especially when the high route or inguinal extraperitoneal method is difficult or actually impracticable

CASE I in my series illustrates a third condition which renders an inguinal operation impossible for stones impacted in this part of the ureter In this patient a stone had already been removed by the inguinal route and another had formed in situ it was therefore impossible to again strip up the adherent peritoneum from the iliac fossa and brim of the pelvis

The juxtavesical portion of the ureter is inaccessible from above in

(1) A male subject with a fat abdominal wall

(2) A female subject owing to the presence of the broad ligament

(3) Cases where a stone has recurred *in situ* after the inguinal operation

The alternative operations which have been employed for exposing this portion of the ureter are

(1) Transperitoneal (2) Perineal (3) Parasacral or pararectal without removal of bone (*i.e.*, the operation performed on these four cases) (4) Parasacral or pararectal with removal of a portion of the sacrum or coccyx (5) Vesical (with dilatation of the vesical orifice of the ureter) (6) Rectal route (7) Vaginal route

The criticism already applied to the transperitoneal route, namely, risk of leakage, more than ever applies to removal of stone by this method from this part of the canal

The perineal route must be very difficult and has peculiar risks attached to it. There is real danger of wounding the rectum, hæmorrhage is usually free, the vesiculæ and vas deferens may be damaged and it is quite impossible to apply sutures to the ureteral wall and difficult to insert bougies afterwards. Notwithstanding the brilliant result in Mr Hurry Fenwick's case already mentioned this operation will probably never become a popular one.

In the female the vaginal route is the operation for choice when a stone can be easily felt by the examining finger. The risks are small and the danger of a subsequent fistula is not great. If the ureter is not adherent it may be easily pulled down by a blunt hook and sutures applied if thought necessary. The rectal route is rightly condemned and requires no further comment.

The vesical route is very difficult and the extraction of stones by dilating the vesical orifice of the ureter hardly feasible unless they be either very close to or impacted in the bladder wall.

There remains for discussion the so-called posterior or inferior routes of access to this portion of the ureter.

The principle in these operations is to reach the ureter from below by opening up the pararectal subperitoneal tissue.

Mr Henry Morris (*loc cit*) has shown that this is pos-

sible in the female and this paper deals with four similar operations performed on male subjects

The ureter was reached with ease in three out of the four cases. In the fourth much difficulty was experienced for special reasons which will be mentioned presently. It was not found necessary to remove any portion of the sacrum or coccyx. The operative procedure employed is not in the least a new one but followed the teaching of Henry Morris and other authorities supplemented by practice on the dead subject. The description of the operation employed in these four cases is as follows.

The patient is placed on the side opposite to that on which the stone is impacted. The semiprone position is employed with the knees well flexed. The pelvis is raised by a small sand bag. The edge of the coccyx on the affected side is well defined by palpation with the fingers from outside. An incision $3\frac{1}{2}$ inches in length is made extending backwards from a point 2 inches from the posterior border of the anus. This incision is half an inch from and parallel with the edge of the coccyx; it passes upwards and outwards lying obliquely to the middle line of the body. The gluteus maximus muscle is exposed and its fibres completely divided for about two inches or more.

The great sacrosciatic ligament and the posterior portion of the ischio rectal fossa are thus exposed. The small and great sacrosciatic ligaments are next divided and the spine of the ischium must be clearly defined with the fingers. This bony point is the first important landmark in the operation.

The fibres of the coccygeus muscle and usually some of the posterior fibres of the levator ani come into view. The former are scratched through with a blunt dissector. The rectal fascia is next exposed and treated in the same manner. The subperitoneal space is then revealed but the rectal wall itself is not defined.

The ureter is next sought for in the subperitoneal tissue. This is the most difficult part of the operation as the ureter remains closely connected to the peritoneum and is somewhat firmly embedded in the subperitoneal fat. It may also be surrounded by a plexus of vessels.

The position of the spine of the ischium is again noted and the ureter sought for lying about $\frac{3}{4}$ inches above the spine in the axis of the operation wound. The best method of searching for the ureter is to use two pairs of long dissecting forceps. The peritoneum and subperitoneal tissue should be caught by the one pair and pulled up from the depths of the cavity. By fixing the peritoneum in this manner the dissection is made much easier. If this precaution is not observed the peritoneum is easily stripped off the lateral wall of the pelvis and tends to sag further and further towards the opposite side and deeper from the surface.

If difficulty is still experienced in finding the ureter and a stone cannot be palpated by a finger passed into the wound deep pressure should be made by an assistant on the abdominal wall in the pelvic region.

Further it is especially important to avoid needless stripping up of the peritoneum as this opens up a greater area of subperitoneal space which may later become septic.

If the ureter is still hidden a search forwards towards the base of the bladder will expose the apex of the vesical seminalis and having defined this the ureter will be found lying close to its inner border.

When the ureter is found and the stone located the latter is if possible displaced to another part of the canal. A longitudinal incision is then made and the stone extracted. A ureteric bougie is then passed down to the bladder and upwards to the kidney. This procedure is important as a stricture may also be present. The opening in the ureter is then closed by fine absorbent catgut sutures inserted after the Lembert principle, the mucous coat must on no account be penetrated by these sutures. A drainage tube is then passed down to the site of the incision. The sacrosciatic ligaments are then sutured with chromic catgut, then the fibres of the gluteus maximus and finally the skin wound leaving an opening at one end for the tube. The opening in the ureter need not necessarily be sutured but in my cases the sutures were inserted without any difficulty.

THE AFTER EFFECTS OF THE OPERATION

In each of these four cases some leakage of urine took place from the wound for a few days. With one exception the wounds healed rapidly and the tube sinus quickly closed.

In Case 4 some fresh leakage occurred later and the sinus reopened and discharged pus but the dependent position of the track allowed natural drainage and checked any tendency to extension of suppuration.

The result of division of this small portion of the gluteus maximus was insignificant some wasting of the posterior part of the muscle could be seen but in two of the patients observed 12 months after the operation no appreciable loss of muscular power was experienced.

The advantages of this operation

(a) The abdominal wall is not incised and therefore the risk of a ventral hernia is absent.

(b) The ureter is directly approached from below and the great disadvantage of stripping up the peritoneum and opening up the retroperitoneal space is avoided.

(c) The hæmorrhage in this operation should be trifling as no vessels of any size are encountered.

(d) There is no risk of damage to the iliac vessels either by carelessly stripping up the peritoneum or later by the presence of the drainage tube.

(e) The position of the wound ensures perfect drainage in the recumbent position.

(f) In the inguinal operations this portion of the ureter lies at a greater depth from the skin surface especially in a fat subject. The actual depth from the surface at which the ureter lay in one of my patients was by measurement $3\frac{1}{2}$ inches.

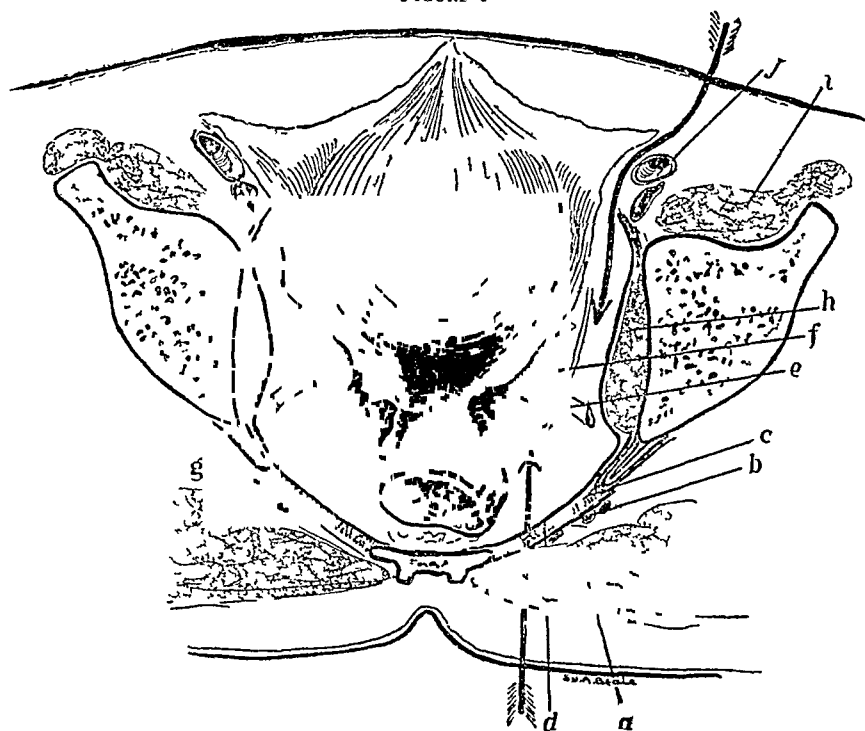
(g) The ureter can be pulled up within easy reach so that sutures can be introduced accurately without any difficulty.

If the stone cannot be felt there may be great difficulty in defining the ureter. In Case No. 3 where a small stone was fixed in the para-schia portion the ureter could not be defined until a transperitoneal exploration was also made. In Case

No 4 on the other hand the ureter was easily found, although no stone was present In Cases 1 and 2 no difficulty was experienced

Figure 1 is a section made from a frozen pelvis The section was made through the lower portion of the coccyx posteriorly and just above the pubes anteriorly

FIGURE 1



a, Gluteus maximus, *b*, sacrospinous ligaments, *c*, coccygeus muscle, *d*, rectal fascia, *e*, ureter, *f*, vas deferens, *g*, rectum, *h*, obturator externus, *i*, iliacus, *j*, ext iliac vessels

This section includes the tissues involved in both the inguinal and pararectal operations The arrows show the paths taken in exposing the ureter by these two routes

Figure 2 —This is a drawing made from a longitudinal section of the female pelvis by Mr Arthur Keith The specimen is in the Museum at the London Hospital Medical College

The cervix uteri has been removed so as to expose the path of the ureter beneath the broad ligament

The following is an abstract of the Cases on which this communication is based

CASE I—E B aged 21 was admitted into the London Hospital on January 6th 1905. He gave a history extending over a period of two years of recurring attacks of right renal colic. He had never noticed any alteration in the urine.

A radiograph was taken and showed a distinct shadow in the right kidney just below the last rib.

On January 13th 1905 a stone composed of uric acid and phosphates was removed from the cortex of the right kidney. A bougie was passed down the ureter into the bladder without encountering any obstacle. The wound was partially closed and an uneventful recovery followed. He left the Hospital on February 9th 1905.

On August 21st 1905 he was re-admitted with the following symptoms. Pain in the glans penis during the act of micturition. This commenced about 3 months after leaving the Hospital and has continued on and off up to the present time. When the pain is severe he has increased frequency of micturition both during the night and day. He has never noticed any hæmaturia. In addition to the penile pain he has had aching in the right loin in the site of the scar.

On admission. The scar looked quite healthy. The right kidney could not be felt and was not tender even on deep palpation. There was no tenderness along the course of the ureter. A rectal examination revealed a tender point at the base of the bladder on the right side but a calculus could not be felt. A radiograph was taken and a distinct shadow could be seen in the right ureter apparently just above the right ischial spine. The urine was acid contained pus corpuscles a small trace of albumen no blood no casts. The amount of urine passed per diem was 18 to 22 ounces.

On August 26th 1905. An incision was made above and parallel with Poupart's ligament on the right side. The muscles of the abdominal wall were divided and the peritoneum stripped up from the right iliac fossa. The ureter was exposed and followed down as far as possible but the stone could not be felt. A small opening was made in the ureter and a probe was passed down. This was stopped apparently just outside the bladder wall.

A finger was then inserted into the rectum and the base of the bladder and lower end of the ureter pushed upwards. A small stone could then be easily felt. The ureter was traced further downwards after some difficulty and an attempt was made to displace the stone upwards but without success. An incision was then made over the impacted stone and it was extracted. The two openings made in the ureter were closed by fine silk sutures including the serous muscular coats only. The lower opening was closed after very great difficulty. A drainage tube was left in situ and the wound partially closed. A discharge of urine took place from the tube for a week. The tube was removed on September 4th and the patient left the Hospital well on September 23rd, 1905.

On February 23rd, 1906, the patient was re-admitted into the Hospital with recurrence of similar symptoms, namely, severe penile pain during micturition, slight increased frequency but no bleeding. The urine was found to contain albumen and pus in small quantities. A radiograph again showed a calculus in the right ureter apparently in the same position as the previous one.

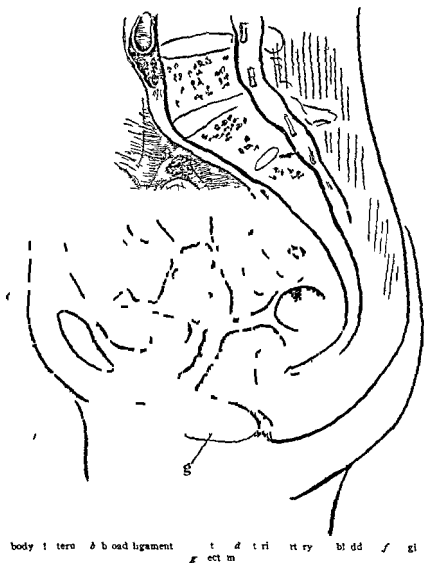
On March 9th, 1906, a transperitoneal operation was made to try and shift the stone upwards from the pelvis to the upper part of the ureter. The patient was placed in the high Trendelenberg position and the attempt was made through an incision in the right semilunar line. The stone, however, was firmly fixed and could not be shifted at all. An endeavor to restrip the peritoneum from the right iliac fossa proved futile as it was firmly bound down by adhesions from the previous operation. The abdominal wound was therefore closed and the patient sent back to bed.

On March 16th, 1906, the patient was again anaesthetized and the stone was removed by a pararectal operation as described above. There was little difficulty in the operation, the stone was found and the ureteral incision sutured with fine catgut sutures. The depth of the ureter from the surface in this case was measured and found to be $3\frac{1}{2}$ inches. A drainage tube was left in and the wound and muscles partially closed by sutures.

There was leakage of urine for 48 hours from the wound but never in any large amount. The wound healed well and the patient left the Hospital on April 13th. The calculus which was removed was composed of phosphates and in its centre was found a small silk suture evidently one of those introduced at the last

operation Since this date the patient has passed two small phosphatic stones via the urethra after more or less severe attacks of colic. Each of these stones contained small silk sutures. The last of these was passed on February 5th 1907

F U R II



CASE II—F P aged 10 was admitted into the Poplar Hospital on May 15th 1906 For three months he had complained of recurring attacks of pain in the right loin and right side of

the abdomen The attacks were severe and accompanied by hæmaturia There was no pain in the penis but the pain during the height of the attacks radiated to the bladder, right groin and testicle

A radiograph showed a well marked shadow in the region of the right kidney and another close to the bladder in the right ureter The bladder had been sounded with a negative result A stone could not be felt on rectal examination

On May 26th, 1906, a stone was removed from the right ureter by a pararectal operation The ureter was easily found as the stone could be felt in the bottom of the wound The stone was extracted and the urethral opening sutured with fine catgut

An incision was next made in the right lumbar region and a stone removed from the pelvis of the right kidney The two operations took 45 minutes There was a little leakage as usual from the pararectal incision for about five days The two wounds healed well and the patient left the Hospital on June 24th

Fig 3 is a photograph taken three months after the operation (Fig 3)

CASE III—F J, aged 35, was admitted into the London Hospital on January 16th, 1907 He complained of recurring attacks of severe colic on the right side The first attack was in August, 1906 The attacks lasted from 3 to 5 days He was quite free from pain in the intervals On one occasion the pain radiated to the right testicle He never had pain in the glans penis Blood was never noticed in the urine and there was no frequency of micturition

On October 10th an examination of the abdomen and by the rectum revealed nothing abnormal The urine was normal A radiograph was taken and a distinct shadow could be seen just below the pelvic brim on the right side He was recommended to take large quantities of fluid in the hope that the stone would pass into the bladder

On November 10th a second radiograph was taken During this interval he had one further attack of severe colic This radiograph appeared to show that the stone had become displaced downwards and was now lying just above the ischial spine

He persevered with the palliative treatment and between this date and January 4th, 1907, he had four further attacks of colic He had no increased frequency, hæmaturian or penile pain



C II—Photograph of calf with perit

A third radiograph taken January 10th showed that the stone was in the same position. Operation was advised and performed on January 19th 1907. The pararectal route was adopted as the stone was thought to be lodged in the juxta vesical part of the ureter. The pararectal space was opened up but the ureter could not be defined and no stone was felt. After a prolonged search a small incision was made in the right semilunar line and two fingers were inserted into the peritoneal cavity. The ureter was then palpated with two fingers in the pelvic cavity and one in the pararectal space. The ureter could thus be easily defined although no stone was felt. On tracing the ureter upwards a very small stone could be felt lying against the lateral wall of the pelvis above the ischial spine. The ureter was next defined from the pararectal wound assisted by the fingers in the abdominal cavity. A small incision was made in its wall and a probe passed upwards for $1\frac{1}{2}$ inch struck against the stone. A pair of urethral forceps were next inserted and pushed up the ureter and after several attempts a small rough oxalate stone was grasped and easily extracted.

The incision in the ureter was closed as before with fine catgut. The small incision in the right semilunar line was next closed and the parasacral incision partially closed. The after progress of this case was prolonged owing to late thrombosis occurring in the left femoral vein. The wound by the coccyx leaked urine for four days then healed up slowly.

On February 10th signs of thrombosis developed in the left femoral vein and on February 27th patient suddenly developed symptoms of pulmonary embolism. This he recovered from but the thrombosis of the leg persisted.

On March 4th a fresh collection of pus developed in the track of the drainage tube in the parasacral wound. This was evacuated and after a few days the wound again closed. Further progress was uneventful.

The difficulties experienced in this case were entirely due to a wrong appreciation of the position of the calculus. It would certainly have been wiser to have approached the ureter in this case by the inguinal route. The patient was a stout muscular man and this added considerably to the depth of the ureter from the surface.

CASE IV.—W M aged 54 was admitted into the London

Hospital on August 4th, 1906 She complained of being ill for 5 or 6 years but much worse for the last 6 months The chief symptoms are pain in the left loin radiating down to the hypogastrium and scalding pain in the urethra during micturition There is much increase in frequency and blood was noticed in the urine on one occasion An abdominal examination was negative On vaginal examination a hard substance could be easily felt in the left fornix apparently close to the cervix uteri

A radiograph showed two definite shadows in the region of the left kidney and a rather large elongated shadow in the pelvis apparently in the lower portion of the left ureter

On August 13th, 1906, an anæsthetic was given and vaginal examination again revealed the presence of a stone in the lateral fornix The bladder was cystoscoped The left urethral orifice appeared to be somewhat dilated

An incision was then made to the left of the cervix uteri through the vaginal wall A stone was reached easily, it was firmly impacted in the ureter and during extraction was broken up into 3 pieces A vaginal douche was given and dressings applied A small gauze drain was inserted down to the ureteral incision The patient was then turned on her right side and the left kidney exposed by the usual lumbar incision The kidney was found considerably atrophied At the lower part in the cortex were found two white cheesy masses embedded in smooth walled cavities, these were evacuated Below these and deeper in the kidney substance was found a very friable calculus about the size of a small marble This was removed The cavities in the kidney were drained with gauze and a drainage tube passed down to the cortex The lumbar wound was then partially closed

After progress The wound in the vagina apparently healed quickly as no urine escaped at all The lumbar wound healed rapidly and no urine escaped All the symptoms were relieved by this operation The patient left the Hospital on September 4th, 1906

Second operation This patient was again admitted into the Hospital on April 2nd, 1907 Two months after leaving the Hospital the old pains returned again She had severe burning pains like needle pricks on micturition The pain was chiefly in the meatus and urethra She also complained of pain in both loins

and in the hypogastrium. She had frequency every half hour night and day. No blood was noticed.

A vaginal examination revealed the presence of another stone in the same position as before and a radiograph corroborated this. Two well marked elongated shadows could be seen. The kidney region showed nothing abnormal. Abdominal examination was negative.

On April 5th 1907 the patient was operated upon a second time as follows. An incision was made in the left lumbar region along the side of the old scar. The kidney was exposed. It was adherent but was freed and removed without difficulty. The organ was very small and the vessels atrophied. No calculus was found.

The patient was next placed in the lithotomy position. An opening was made in the vaginal wall as before and two phosphatic stones removed from the left ureter. A probe was passed up the ureter. A vaginal douche was given and perineal dressings applied. No drain was used.

The after progress of this case was uneventful and the symptoms were again entirely relieved by the operation.

In this case it would probably have been better to have removed the kidney at the first operation and so avoided the fresh formation of stones.

CASE V—S.L. aged 22 admitted into the London Hospital on February 14th 1907.

History—In July 1906 a stone was removed from the upper part of the left ureter at University College Hospital. In November 9th 1906 he was admitted into the London Hospital and a stone was removed from the paraischial portion of the right ureter by the inguinal route. The wound drained insufficiently and leakage of urine was followed by spreading suppuration in the subperitoneal tissue. On December 17th 1906 an abscess was opened in the right flank which had tracked up along the abdominal wall.

The patient left the Hospital soon after with wounds healed. The present symptoms commenced in January 1907 in the left lumbar region aching in character sometimes radiating down along the course of the left ureter and involving the left testicle. The pain was always present but sharp exacerbations occurred two or three times a week. There was also pain in the glans penis.

after micturition There was no hæmaturia The urine contained a trace of albumen and some pus

A radiograph showed an indistinct shadow apparently due to a stone in the juxta-vesical portion of the left ureter

On February 22nd, 1907, the pelvic portion of the left ureter was explored by the pararectal route The ureter was found easily It did not appear to be abnormal A small longitudinal incision was made in its wall and a ureteric bougie passed down to the bladder and up to the pelvis of the left kidney A stone could not be felt

The ureter was then hooked up and two catgut sutures were inserted to close the wound A small tube was left in situ and the muscles and skin united Slight leakage of urine was noticed for two days The tube was removed altogether on March 1st, that is 7 days after the operation and the wound healed rapidly The patient left Hospital with complete relief of his symptoms

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ANTIPHLOGISTINE VERSUS OPIUM

Inflamed states of the various organs of the body frequently give rise to pain of such urgent character as to demand active steps looking to its relief. Upon seeing the patient for the first time (he has called his physician because his suffering has become intolerable), the medical attendant is met with a peremptory demand for relief from the suffering.

With a willingness, which frequently overrides their better judgment, some physicians resort to the hypodermic needle indiscriminately, and, in too many cases, a greater evil has followed the lesser one. The free habit of using morphine or some other form of opium is not a judicious practice, and for several reasons. The exact seat of an inflammation, for instance, might become difficult to locate, and thus a clear diagnosis interfered with. But the greater objection to the use of opium is the possibility of adding a recruit to the ever-growing army of habitués.

Every time there occurs to a doctor the apparent need for opium he should deliberate well before resort is had to the needle. If, after careful consideration, his best judgment advises the use of opium, it should be given in some form by mouth. If the needle is used the patient at once knows what he is getting, but he is not so likely to require this information if it be given otherwise.

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THE VALUE OF CODEINE

The *Cleveland Medical Journal*, quoting from the *Denver Medical Times*, concerning codeine, states, that, according to Butler, "it is less depressing and more stimulating than morphine, does not constipate, cause headache or nausea, and rarely leads to the formation of a habit. Codeine seems to exert a special, selective, sedative power over the pneumogastric nerve, hence its value in irritative laryngeal, pharyngeal, and phthisical coughs with scanty secretion. Like morphine, it has proved of value in checking the progress of saccharine diabetes, and it has been used for long periods, without the formation of the drug habit, inasmuch as when glycosuria was brought to a termination by dietary and other measures, the cessation of the use of codeine was not followed by any special distress. The effects of codeine on the alimentary canal are remarkable, in that it assuages pain as well or better than morphine and nevertheless does not check the secretions or peristalsis notably, unless the latter is excessive, as in dysentery." In view of these facts it would seem that Antikamnia & Codeine Tablets are a remedy which should find a wide field. Professor Schwarze (*Therapeutische Monatshefte*), in writing upon the treatment of the different forms of dysmenorrhœa, and the different forms of congenital deformity of the uterus, states that the coal-tar analgesics are of much use, as well as the preparations of iron and sodium salicylate. In many cases it is necessary to administer codeine in small doses, and the tablets of "Antikamnia & Codeine" would seem to have been especially prepared, in their proportions, for just these indications.

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WASN'T IT STRANGE?

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Then began the wearisome round of the publishers' offices, with the novice's usual luck. One day, just before his departure for the Hoosier State, he met an acquaintance who knew of his ambition, and who asked what luck he had encountered.

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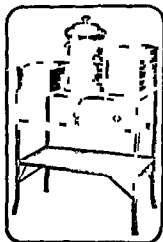
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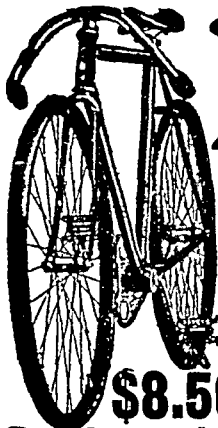
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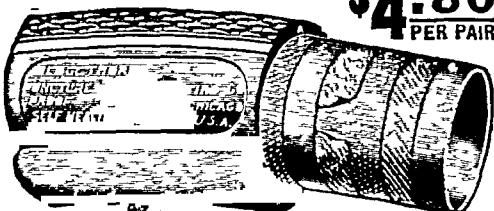
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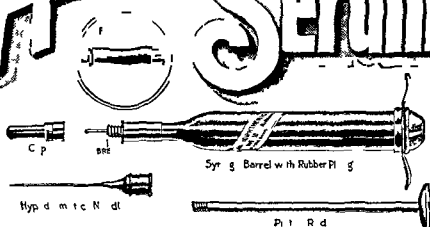
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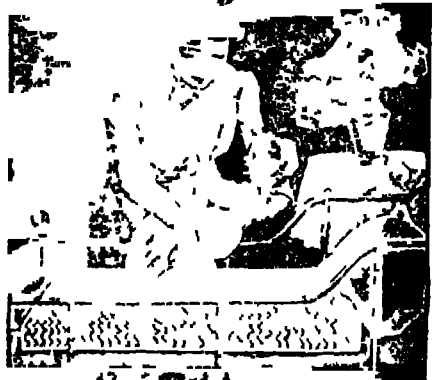
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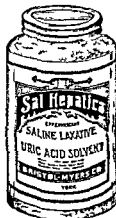
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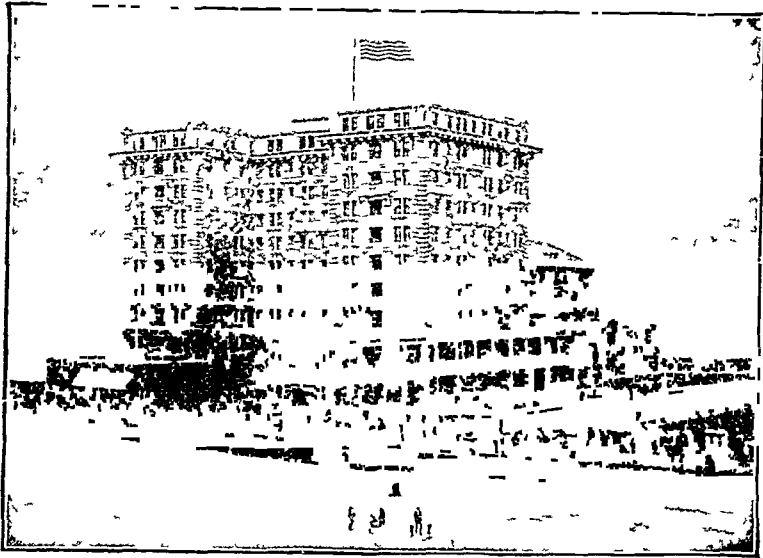
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ANNALS OF SURGERY

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No 6

ORIGINAL MEMOIRS

CARCINOMA OF THE ŒSOPHAGUS

A CLINICAL AND PATHOLOGICAL STUDY FROM THE PATHOLOGICAL DEPARTMENT
OF THE ST LOUIS UNIVERSITY MEDICAL SCHOOL

BY M G SEELIG M D
OF ST LOUIS MO

THE following case history with the appended autopsy findings is of more than usual interest both from the clinical and pathological point of view

L H 55 years old of German nativity a brewer by occupation applied for treatment on July 4 1906

Family History—Negative

Past History—Up to the onset of his present illness the patient was never sick. He has always had a chronic eczema of the face and neck but has never been bothered much by it. He denies gonorrhœal and syphilitic infections.

Present History—One year ago he noticed that he was gradually growing hoarse. This hoarseness did not follow a cold and was accompanied neither by disturbance of the respiratory function nor by any laryngeal discomforts or pain. A few months after he first noticed the hoarseness he began to experience slight difficulty in deglutition particularly on attempting to swallow an insufficiently masticated piece of meat. This difficulty in swallowing gradually grew more pronounced so that chopped meat and mashed potatoes and finally only fluids could be taken. Of late even the swallowing of fluids has been accomplished with difficulty. He locates the obstruction just within the upper

aperture of the thorax Hand in hand with the difficulty in deglutition there has been an increasing sense of weakness, and a progressive loss of weight from 210 to 150 pounds Pain has never been a symptom of the disease and all other bodily functions except those of phonation and deglutition are normally performed There is an occasional tendency to cough, with mucopurulent expectoration, which, however, has never been blood streaked

Physical Examination—Tall, emaciated individual Scaly eczema of neck and both cheeks Tongue moist and clean Teeth and gums in good condition Complexion that of pronounced secondary anemia Pupils equal, reacting sharply to light and accommodation A few small lymph nodes in both axillæ and groins Voice harsh and rasping, distant, and at times purely sibilant in quality

Neck and Throat—There are no enlarged cervical lymph nodes, but just below the cricoid cartilage is a hard, infiltrated mass of tissue occupying the site of the isthmus of the thyroid gland This mass, which moves up and down with the trachea on deglutition, feels like a calcified thyroid isthmus, the skin over it being freely movable No tracheal displacement or tracheal tug Laryngoscopic examination shows the left vocal cord to lie in the cadaveric position, and not to participate in phonation Attempts to swallow water are followed by regurgitation of some of the fluid through the nose, the noise of the regurgitation rendering it impossible to time the swallowing sounds by auscultation

Thorax—The chest is distinctly barrel-shaped, and expansion, on deep inspiration is minimal Breathing, markedly abdominal in character, is aided perceptibly by the accessory muscles of respiration The percussion note over the entire anterior and posterior aspect of both chests is pronouncedly tympanitic Auscultation discloses numerous sibilant and sonorous râles over both chests, together with a prolonged expiratory murmur The breath sounds at both bases, posteriorly, are very distant

Heart—It is impossible to mark out the heart borders, owing to the tympany of the overlapping emphysematous lungs There is a soft blowing systolic murmur over the aortic valve Neither the second aortic nor the second pulmonary sounds are exaggerated, but the sounds both at the base and at the apex are weak

The pulse is weak beats 76 times to the minute and shows a pronounced tendency to intermit a beat every fourth or fifth cycle. The left radial pulse seems to be slightly weaker than the right and to be a bit delayed. The radials are distinctly sclerotic and the tension within them is higher than normal. The temporal vessels are tortuous and hard. There is no visible pulsation nor palpable thrill over the cardiac area.

Abdomen—Markedly carinated. Palpation and percussion negative.

Extremities—Negative.

Urine—Acid. Sp. grav. 1030. Trace of albumen. Few hyalogramgranular casts.

Here then was a patient whose history suggested both an aortic aneurysm and a neoplasm of the œsophagus. The clearly defined onset with an involvement of the recurrent laryngeal nerve spoke in favor of aneurysm whereas the progressive dysphagia to the point of complete obstruction and the pronounced cachexia spoke for neoplasm. It was impossible to elicit any signs that would absolutely confirm the diagnosis one way or the other. Dr. W. E. Sauer attempted to establish the presence of a new growth by means of the œsophagoscope but was unable to do so owing to the severe dyspnoea and cyanosis caused by the introduction of the instrument. The absence of pulsation thrill and tracheal tug combined with the impossibility of percussing out the area of heart dullness owing to the pulmonary emphysema rendered it impossible to make a positive diagnosis of aneurysm.

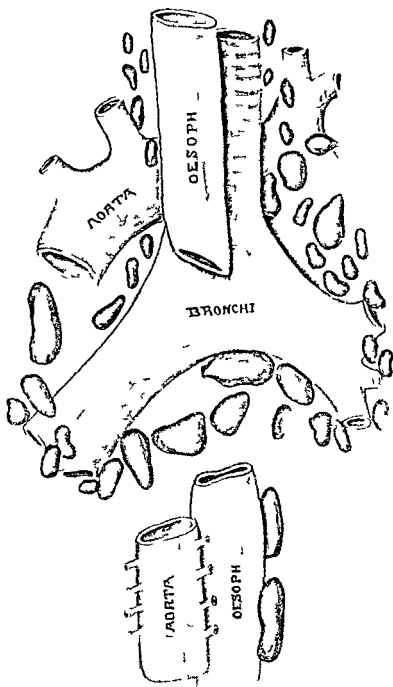
In the hope of securing some data that might aid in differentiating between cancer of the œsophagus and aneurysm of the aorta the literature was searched for cases similar to the one under observation. The search resulting in the discovery of not a few cases in which it was impossible to differentiate between the two conditions. Kuchen¹ reports two cases of carcinoma of the œsophagus in which the diagnosis of aneurysm of the aorta was made and in which the correct diagnosis was not even suspected until it was disclosed by autopsy. The French clinician Carrière² made an exactly similar error and the great German clinician Traube³ made a similar mistake. Both Carrière and Traube were aware that the condition

confronting them might be either aortic aneurysm or œsophageal new growth, but they made a positive diagnosis of aneurysm, only to find out their mistake, at autopsy Gebauer⁴ reports a similar experience, as does also Kirchgæsser,⁵ and in our own country, Snow⁶

If one will bear in mind the intimate relationship existing between the œsophagus and the lymphatic apparatus of the mediastinum, he will readily perceive how two conditions so diverse as carcinoma of the œsophagus and aneurysm of the aorta may cause almost identical symptoms. Fig 1 represents the arrangements of the lymph nodes in the mediastinum that act as the first relays from the œsophageal lymph vessels. (See also "Ueber die Lymphgefäße des Oesophagus," H. Sakata, Mit a d Grenz d Med & Chir BXI H S, 1903) These nodes are in actual contact with the œsophagus, and as a result, secondary involvement of them occurs very early after the invasion of the œsophagus by carcinoma. Such being the case we have a tumor growth started in the mediastinum which may cause all the symptoms and physical signs that are ordinarily caused by an aneurysm. Moreover, this mediastinal tumor may develop so much more rapidly than does the primary tumor of the œsophagus, as to give pronounced intrathoracic symptoms before there are any signs of obstruction of the lumen of the œsophagus. Naturally these symptoms are due to pressure on the mediastinal organs, and are therefore identical with the symptoms caused by pressure of an aneurysm on these same structures.

Pain (scapulo-humeral, scapulo-cervical, or intercostal) is a characteristic feature of aneurysm, supposed by Fraenkel⁷ to be due to pressure irritation of branches of the cardiac plexus ramifying in the periaortic connective tissue. But both Kucken (1c) and v Ziemssen⁸ state that carcinoma of the œsophagus may be accompanied by severe, spontaneous pain, simulating in every detail the pain caused by aneurysm.

Dyspnœa, which is a fairly constant sign accompanying aneurysm is almost as constant a characteristic of carcinoma of the œsophagus. This symptom, just as is the case with the



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symptom of pain is referable to pressure by either the aneurysm or the mediastinal metastasis from the œsophageal new growth on the bronchi or trachea

Involvement of the recurrent laryngeal is usually regarded as a strongly confirmatory sign of aortic aneurysm but such an assumption is not warranted by facts For example Schech⁹ collected 42 cases of paralysis of this nerve and in the series he found that 5 cases were due to aneurysm of the aorta 4 to carcinoma of the œsophagus and 3 to mediastinal and pulmonary tumors These figures and similar ones collected by Hampeln¹⁰ and Avellis¹¹ illustrate of how little aid the symptom of recurrent laryngeal paralysis is in differentiating between the two conditions Ehret¹ cites a case of carcinoma of the œsophagus in which the only symptom of importance was hoarseness due to involvement of the recurrent laryngeal nerve It has been suggested that in aneurysm the degree of hoarseness varies from time to time owing to slight changes in the position of the aneurysmal sac whereas in carcinoma of the œsophagus the paralysis is a constantly progressive one But even this distinction does not hold always for in the case cited by Kucken (1c) varying degrees of hoarseness were caused by an œsophageal tumor the recurrent laryngeal nerve not being directly involved in the mediastinal metastasis being encroached upon merely by a local œdema which varied from time to time and which was caused by the presence of the new growth in the immediate neighborhood

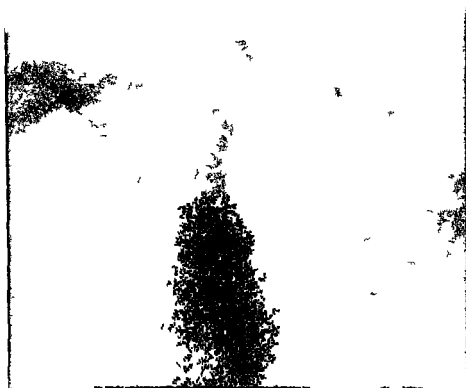
Dysphagia very naturally suggests that we are dealing with a tumor of the œsophagus Lebert¹³ however states that in one third of all cases of aneurysm of the aorta the œsophagus is compressed sufficiently to cause dysphagia Even if the sac does not press directly on the œsophagus it can cause dysphagia by pressure on the vagus and its œsophageal branches It is also a fact that a cancer of the œsophagus may grow only in the long axis of the tube so that it causes no obstruction or the growth may extend around the lumen of the œsophagus and be ulcerated sufficiently to preserve a free passageway for food

Even the presence of a well marked cachexia does not add very strong corroborative evidence of a malignant neoplasm, for we are obliged to express our knowledge of cachexia in terms of a secondary anæmia, and a large proportion of all patients suffering with aneurysm of the aorta show a well pronounced secondary anæmia, due to a complicating nephritis, or endarteritis

Thus we see, that all the cardinal signs of both conditions may fail to lead to a correct conclusion. A few years ago, it was hoped that the use of the X-ray would enable us to differentiate between aneurysm and carcinoma of the œsophagus with a degree of absolute surety, but Kuchen's two cases (1 c), Kirchgaesser's case (1 c) and my case illustrate the fact that this hope was baseless. Fig 2 shows an X-ray of the thorax of my patient. The shadow (outlined with dotted white line) is strikingly similar to the outlines of various aortic aneurysms of the aorta pictured in Walsham and Orton's work¹⁴ and by Stover and Hall¹⁵. Moreover, the lighter shadow seen between the two dotted lines at the left margin of the outline represent pulsation, which was also clearly seen through the fluoroscope. In Kuchen's and Kirchgaesser's cases the diagnosis of aneurysm was falsely based on a similar X-ray picture of a pulsating tumor. In reality, the shadow represents the mediastinal mass of new growth to which pulsation is transmitted by the underlying aorta. I am indebted to Dr R D Carman both for the excellence of the X-ray work, and for many valuable suggestions in interpreting the X-ray findings.

A consideration of the conflicting testimony offered by these various subjective and objective signs fully substantiates the statement of Kuchen that great, and often insurmountable difficulties in diagnosis attend cases of carcinoma of the œsophagus when the growth is situated in the thoracic portion of this viscus, and particularly when there is an early involvement of the mediastinal connective tissue. In the particular case under discussion, Dr Iralsen who had referred the patient to me, Dr Sauer who also examined the patient, and I myself

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inclined most strongly to the diagnosis of carcinoma chiefly on account of the complete œsophageal obstruction

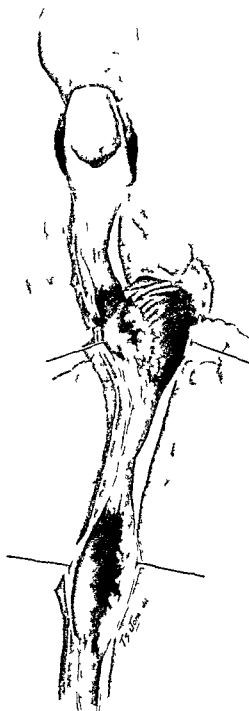
The patient consented willingly to the proposal that a permanent gastric fistula be made and agreed to enter the hospital within a week. At my first hospital visit to him a week after my first examination he informed me that for two days past he had been able to swallow with perfect ease that he had even tested his swallowing capacity by eating green corn and stated that he was able to swallow whole mouthfuls of unmaستicated kernels without the slightest difficulty. This ability to swallow returned suddenly as he was attempting to eat a piece of meat by way of experiment. The patient himself was hopeful that this fact would render the operation unnecessary but we construed it to be the only one definite sign that made the diagnosis of carcinoma almost certain. The dysphagia accompanying an aortic aneurysm may vary in degree as we have seen above dependent upon slight changes in the position of the aneurysmal sac but such changes in position never lead to a sudden complete restoration of the lumen of the œsophagus. Such an occurrence as this must be dependent upon a diminution in the size of the compressing sac due to sudden rupture or perforation phenomena which give rise to serious general symptoms. Our patient experienced no threatening symptoms merely passing quietly from a state of complete dysphagia to one of unimpeded swallowing due we thought to ulceration of an obstructing œsophageal tumor.

Considering the restored function of swallowing as a confirmatory sign of carcinoma of the œsophagus we performed a typical Senn gastrostomy under $\frac{1}{2}$ per cent cocaine local anesthesia. The operation was done on the basis that the new growth would be sure to obstruct the œsophagus again at a later date when perhaps the condition of the patient would be such as to preclude the idea of operative interference. The operation disclosed a markedly contracted stomach but there was no demonstrable evidence of new growth either in the abdominal portion of the œsophagus or in the cardiac end of the stomach. The patient left the hospital on the tenth day after the operation with a thoroughly efficient gastric fistula.

The subsequent course of the disease was marked by a transitory gain in weight and strength due to the ability to take more nourishment. After the elapse of a month however weak

ness began to be a pronounced symptom, and five weeks after the operation the patient was obliged to take to his bed. Up to this time he ate freely of all varieties of food. Gradually, signs of obstruction reappeared and progressed so that six weeks after operation the patient was unable to swallow fluids. At this same time a distressing cough developed, accompanied by a very foul muco purulent expectoration. The weakness grew more and more profound despite frequent feedings through the fistula, and death supervened eight weeks after operation.

The autopsy, performed six hours after death by Dr. D. L. Harris, disclosed nothing of importance except in the thorax, therefore only that part of the protocol relating to the mediastinal structures will be stated. The entire mediastinum, from the upper aperture of the thorax down to the diaphragm was filled with a dense nodular mass, slightly fusiform in shape, the greatest diameter of the spindle being posterior to the fourth sternocostal articulations. This mass, which was a pearl gray in color, extended through the upper outlet of the thorax into the root of the neck, where it seemed to end by infiltrating the isthmus of the thyroid gland. Within the chest, the mass was fused with the lungs at their roots, but throughout the rest of its extent it was not intimately attached to the lungs. The whole mass which was removed in connection with the neck organs, is shown in Fig. 3. Six cm below the laryngeal aperture, there is an irregular cavity the size of a small hen's egg opening into the anterior wall of the esophagus. The walls of this cavity, lined with a foul, greenish-black, necrotic membrane, are made up of the jagged, eroded remains of six or eight tracheal rings on the right, and by tumor mass on all other sides. Six cm below this cavity there is another one of exactly the same character, except that it has no tracheal remains in its makeup, and is smaller in extent as a result of not having ulcerated so deeply. This lower cavity has not ulcerated into the mediastinum. Extending from the upper to the lower cavity, is a chain of markedly enlarged firm anthracotic periesophageal lymph nodes, which on section show unmistakable evidences of invasion by new growth. Sections made from the walls of both cavities, from the isthmus of the thyroid, from the mass of mediastinal tissue, and from the periesophageal lymph nodes all showed typical squamous cell carcinoma (epithelioma).



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These findings although they confirmed the diagnosis of an obstructing carcinoma of the œsophagus were surprising in that they disclosed a second unsuspected tumor at the lower end of the viscus. The presence of this second tumor immediately suggested the possibility of determining whether or not we were dealing with two primary tumors of the œsophagus and at the same time of determining along what courses metastases occur in an œsophagus that is the seat of multiple tumors.

As regards the first problem namely whether the two tumors were primary or not it is practically impossible to show that two morphologically identical tumors occurring in the same organ are primary tumors. Had the upper tumor been a squamous cell carcinoma and the lower one a cylindrical cell carcinoma one would have been fairly well justified in pronouncing them to be two primary tumors. As the case stood however the rational assumption was that the lower tumor was secondary to the upper one for it was smaller in size less widely surrounded by dense extra œsophageal new growth and less extensively ulcerating. Any one attempting to prove that these two tumors were both primary would have to bear in mind that there are similar cases quoted in literature in which it was impossible to prove this point (Beck¹⁶) and that pathologists contend that a diagnosis of multiple primary tumors should only be made after excluding every possibility of any type of metastasis. Bucher¹ and Billroth¹⁸ went even further than this in claiming that a diagnosis of multiple primary tumors may be made only when

- 1 The tumors have different histological structures

- 2 Each tumor has a genetic relationship with the tissue in which it is growing

- 3 Each tumor makes its own metastases

Assuming then that the lower tumor was a secondary growth the problem as to how it originated remained to be solved. In order to solve it it was necessary to dissect the œsophagus out of the bed of the new growth in which it lay preparatory to making a serial section study of the entire organ. Very little dissection was necessary for the œsophagus was

adherent to the bed of new growth only at the margins of the upper and lower ulcers. After this dissection was accomplished the œsophagus (which had previously been opened down the middle line anteriorly) consisted of a ribbon of tissue 5 inches long, $1\frac{1}{4}$ inches wide, and about 1-10 of an inch thick. In order to avoid working with the enormous number of sections that would have resulted from cutting this strip of tissue transversely throughout its whole length, the strip was rolled upon itself much as a piece of dough is rolled to make a "jelly roll". With the strip held in this form by means of a piece of thread tied around it, it was fixed, hardened, and embedded. Fig. 4 is a diagrammatic representation of sections cut through the rolled up strip. The jet black coloring, represents deposits of new growth. No attempt is made to picture the histological structure of the coats of the œsophagus, or of the new growth itself, but the black deposits are exact reproductions in outline of various types of metastases that were met with, in looking over all the sections. The centre of the spiral strip represents the tumor that was situated at the upper end of the œsophagus, and is labeled 2. 1 shows the tumor that was situated at the lower end of the œsophagus. 3 represents a type of growth by continuity, extending down the œsophagus from the primary tumor. 4 is a small polypoid tumor which has all the characteristics of an implantation metastasis on the mucosa. This small tumor dips well down in the submucosa, but has grown most actively out into the lumen of the œsophagus. 5 represents a similar small metastasis which, however, instead of growing into the lumen, has grown outward toward the muscularis by means of two or three tongue shaped processes. 6 shows a metastasis confined exclusively to the submucosa and evidently originating in some of the lymph spaces of this coat of the œsophagus. 7 represents a deposit that grew into the lymph spaces of the muscularis from the outlying mass of carcinomatous tissue. Among all of the sections examined I could find none that showed lymph vessels crowded with squamous epithelial cells, so it was impossible to trace any of the metastases back to their original source.



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through a series of sections. Hundreds of sections were examined without finding in them any evidence whatsoever of metastases and no single section contained more than one type of metastasization. For the sake of convenience all the types of metastases found are represented on one chart.

This work was done because I could not find a detailed study of the course along which metastases occur in the œsophagus. An encyclopedic work such as Borst's *Geschwulstlehre* merely makes scant mention of the fact that there may be variously distributed intra-œsophageal metastases whereas most of the larger works on surgery do not say even as much as that. It was not hoped that any definite scheme could be demonstrated whereby either the occurrence or route of intra-œsophageal spread of new growth could be explained. The whole question of metastases formation is still too much involved to admit of the deduction of any firm and fast laws. For example Bucher (1c) contends in a lengthy and learned article that we are never justified in calling a small deposit (such as No. 4 and Fig. 3) an implantation metastasis until every other possible method of metastasization has been ruled out. He believes that most of the so-called implantation metastases are in reality metastases that have occurred by retrograde lymph transport. Carmalt¹⁹ also speaks of the great difficulty of proving that a small metastasis in the œsophagus is in reality an implantation growth. He mentions the possibility of a particle of the epithelial lining becoming detached high up and clinging so closely to a spot lower down that it presents all the appearances of an epithelial new growth. In our own case this is surely not true for the submucosa is invaded by the small metastasis.

The study of the foregoing case demonstrated the difficulty of differentiating aneurysm of the aorta from carcinoma of the œsophagus by means of clinical data. Illustrated the formation of multiple metastases in the œsophagus and suggested that these multiple metastases may occur (a) by implantation (b) through the lymph spaces in the submucosa (c) by extension into the œsophagus from a mediastinal

metastasis, (d) by continuous growth above the lymph spaces of the mucosa, and (e) through the lymph spaces of the muscularis

- ¹ Kucken, *Deutsch Med Woch*, nos 45-47, 1902
- ² Carriere, *Arch Clinique de Bordeaux*, Bd xvi, no 1
- ³ Traube, *Arch f Heilkunde*, Bd xvi, H 3
- ⁴ Gebauer, *Deutsch Med Woch*, no 35, 1900
- ⁵ Kirchgaesser, *Muench Med Woch*, no 19, 1900
- ⁶ Snow, *Univ of Penn Med Bulletin*, December, 1904
- ⁷ Fraenkel, *Deutsch Med Woch*, nos 50-51, 1891
- ⁸ v Ziemssen, *Handbuch d Spec Path und Ther*, Bd vii 1
- ⁹ Schech, *Muen Med Woch*, no 51, 1888
- ¹⁰ Hampeln, *Zeit f Klin Med*, Februarv, 1901
- ¹¹ Avelis, *Berl Klinik*, H 40, 1891
- ¹² Ehret, *Deutsch Med Woch*, no 36, 1901 (supplement)
- ¹³ Lebert, *Virchow Hand d Spec Path und Therapie*, B V Th 2
- ¹⁴ Walsham and Orton, *The Roentgen Rays in the Diagnosis of Diseases of the Chest*, London, 1906
- ¹⁵ Stover and Hall, *Boston Medical and Surgical*, January 1, 1907
- ¹⁶ Beck, *Zeit f Heilkunde*, B 5, 1884
- ¹⁷ Bucher, *Beit z Path Anat*, B xiv
- ¹⁸ Billroth, *Allg Chir Path und Ther*, 1889, p 908
- ¹⁹ Carmalt, *Virch Arch*, B 55

TONSILLAR HEMORRHAGE AND ITS SURGICAL TREATMENT

BY CHEVALIER JACKSON M D

OF PITTSBURGH PA

Few operations in surgery are so generally done badly as those upon the tonsils. Tonsillotomy is an easy but an utterly unjustifiable operation. Tonsillectomy is an exceedingly difficult operation to do ideally. Personally the author is satisfied with but few of his tonsillectomies.

Nearly all operators at the present day slice off the projecting portion of the tonsil with a tonsillotome apparently with the mistaken idea that the object is to rid the patient's throat of the mechanical obstruction to the passage of air caused by this projecting portion. Such an operation seals up the glandular tissue of the deeper portion of the tonsil under bands of cicatricial tissue which forever will interfere with throwing off of leucocytes secretions epithelial and other debris which will for years continue to be produced if any glandular tissue be left behind. If the patient has had periodical attacks of acute tonsillitis he will have them more often than before. Patients frequently allude to such a case when tonsillectomy is proposed mentioning the fact that the patient was made worse instead of better. One of the reasons why most operators hesitate to remove all of the tonsil is the fear of hemorrhage. As a matter of fact hemorrhage is much more likely to occur after partial than after complete removal for the vessels of the diseased glandular and cicatricial tissues do not retract as do those of the normal tissues in the bed of the tonsil. However it is not on this account that tonsillectomy is urged in preference to tonsillotomy. Rheumatism infective arthritis endocarditis tuberculosis and a host of other ills that modern research has traced in many instances to the tonsils are made worse or their occurrence is rendered more likely by incomplete removal.

The proper and surgical way to remove the tonsil is to dissect it out completely capsule and all clear down to its bed of muscular tissue, and then immediately deal with the hemorrhage by twisting the vessels with long hemostats. Oozing of more than a few minutes duration after tonsillectomy is exceedingly rare. Dozens of times the author has been called in consultation where the bleeding was said to be an oozing and he has found upon lifting forward the anterior pillar an artery spurting. If the pillar was allowed to fall back into place the spurting jet struck against the posterior surface of the pillar and, flowing over the tonsillar wound, simulated an oozing from the wound so closely that any one who did not take the precaution to lift the anterior pillar would never suspect the source of bleeding.

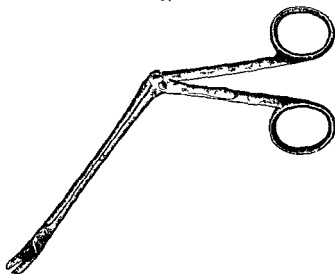
Oozing is simulated in another way. If spurting arteries and bleeding veins, be not twisted, as they should be, promptly after the removal of the tonsil, some of these vessels may partially retract, yet not sufficiently to stop bleeding, and being covered with a layer of fresh clot, may keep on bleeding for hours in what seems to be an oozing. Had torsion with hemostats been promptly applied when the tonsil was removed there would have been no oozing. Vessels too small to be seen and twisted cannot bleed more than a short time, except in cases with abnormal blood as in hemophilia, or with abnormal vessels as in general arterial changes, or local changes due to disease or its products in the tonsillar tissue. Obviously, the latter cannot be a factor if the tonsil be entirely removed. The snare is apt temporarily to close the vessel mouths which later will open owing to mechanical movements of the musculature surrounding the wound. It is far better to do a clean cutting surgical operation, promptly followed by surgical hemostasis with hemostats promptly applied to all bleeding vessels while they are readily located by their blood streams. If the anterior pillar be retracted the vessels can always be seen after any tonsillectomy worthy of the name.

Oozing properly so-called is the bleeding from numerous vessels too small to be twisted or ligated. This occasionally

occurs from the muscular cicatricial or other tissue in the wound after the removal of the tonsil. This can be immediately stopped by the insertion of a gauze sponge which will be held in place by the pillars. If there be not a large enough cavity for the retention of a sponge the size of a walnut it may nine times out of ten be truthfully said that a complete tonsillectomy has not been done.

The best instrument for removal of the tonsil is largely a matter of personal custom. The author has always maintained that the tonsillotome was an unjustifiable instrument

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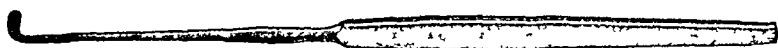


A th t ns l

because it sliced off the projecting portion of the tonsil leaving the submerged portion to be sealed over with cicatricial tissue. He has found recently, however, that the fault is not with the tonsillotome but with the tonsillotomist. Dr. George L. Richards has demonstrated that it is possible to do a tonsillectomy with a tonsillotome. He frees the tonsil with his finger until it is possible to pull the tonsil out so that a pedicle is formed. Then he severs the pedicle with a tonsillotome from which the fork has been removed. A forceps is used to pull out the tonsil the ring of the tonsillotome being first threaded over the

forceps, from the shank of which the tonsillotome dangles while the tonsil is being seized. If the same care in freeing the tonsil and pulling it out to a pedicle be taken, the snare might be used, and the author has often so used it. But the objection to the snare is the same as to ice and other hemostatics, that while it lessens hemorrhage at the time, it is more

FIG 2



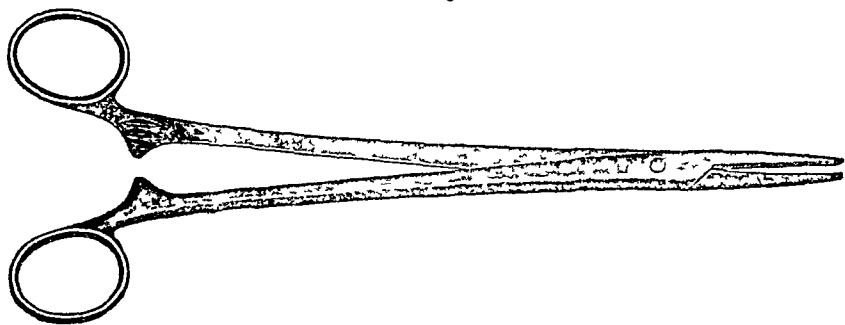
Author's anterior pillar retractor

apt to be followed by secondary hemorrhage. It is far better to make a clean cut which will bleed freely, and let the operator see the large vessels that he may apply torsion.

Ballenger does a beautiful operation with a knife.

The author's preference is for the scissors, and he uses the scissors shown in Fig 1. He pulls out the top of the tonsil with a Sandels' forceps, and at the first clip gets external to

FIG 3



Author's tonsillar hemostat

the capsule which is then rapidly ripped away from the tonsillar bed entire and attached to the tonsil, using the blunt end of closed scissors blades as a dissector. Occasionally old cicatrices from peritonsillar abscesses will require clipping.

The anterior pillar is then lifted with a retractor (Fig 2) while the hemostat serves as a tongue depressor, if one is needed, and the bleeding vessels are immediately found and twisted with the hemostat (Fig 3) while they are readily seen

by the free flow of blood from their open mouths immediately following their severance. It is to urge this surgical hemostasis at operation and to point out the error of using ice and other hemostatics to stop bleeding which if thus stopped is prone to recur subsequently that this paper is written. As elsewhere urged by the author (*N Y Med Jour* Aug 17 07) when the bleeding cannot be arrested or having stopped is likely to recur and be fatal external carotid ligation should be done at once. It is a simple operation of ten or twenty minutes duration it may be done under infiltration anesthesia and it is practically without ulterior unfavorable results.

CONCLUSIONS

- 1 Tonsillotomy is an unjustifiable operation
- 2 Tonsillectomy is less likely to be followed by hemorrhage than is tonsillotomy
- 3 Oozing after tonsillectomy is exceedingly rare. It is bleeding from a vessel concealed back of the anterior pillar that is usually mistaken for oozing
- 4 The use of ice to the neck and face or locally over the wound and other hemostatics are unsurgical and are liable to be followed by secondary hemorrhage
- 5 A gauze sponge pushed into the cavity left by the removal of the tonsil will stop slight bleeding but should never be used when the bleeding is from a vessel large enough to be twisted. If there is not a sufficient cavity to permit the retention of a gauze sponge the size of a walnut by the anterior and posterior pillars the tonsil is not all out and the operation is incomplete
- 6 Hemostasis with hemostats promptly done while the vessels are plainly visible by their bleeding immediately after they are severed promptly arrests hemorrhage and the torsion forestalls secondary hemorrhage
- 7 Any hemorrhage not controllable by torsion can be and should be immediately stopped by rendering the whole area anemic by the ligation of the external carotid artery
- 8 An anterior pillar retractor and a few long hemostats are an absolute essential to every tonsillectomy armamentarium

LINGUAL GOITRE

BY R A STIRLING, M D,

OF MELBOURNE, AUSTRALIA,
Surgeon to the Melbourne Hospital

IN the *Lancet* December 8, 1906, Mr G H Makins relates a case of lingual goitre, and states that in the various collations of published cases, not more than between thirty and forty instances have been recorded

It is very remarkable that soon after reading the excellent description of the tumor in his case, an almost precisely similar one was referred to me by Mr Phillpotts, one of the dental surgeons at the Melbourne Dental Hospital

The patient, Vena L, aged twelve, was a bright, healthy looking girl She states that two years ago she complained to the family medical attendant of sore throat—when he called her attention to a swelling at the back of the tongue This had never been noticed before, but she has found since, especially latterly that there was increasing difficulty in swallowing and speech There has never been any bleeding from the tumor She has always been healthy and has not yet menstruated She complains of thickness of speech, and thinks that the tumor has increased in size recently, and there is always some difficulty in breathing whenever she catches cold

She was in a hospital some months ago, where it was proposed to remove the tumor, but her father demurred at the possibility of the tongue being divided in the centre

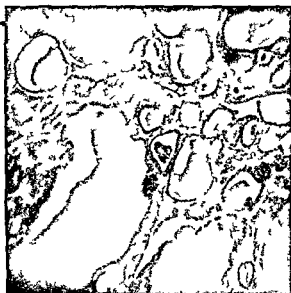
On inspection of the mouth, there is a rounded swelling, about the size of a very large marble, placed on the centre of the base of the tongue (Fig 1), projecting upwards between the fauces, and apparently springing from the region of the foramen cæcum, the tumor is pinkish in color, covered with mucous membrane showing a very vascular network, and extends down towards the epiglottis for an inch and a quarter—but the laryngoscope shows it is not attached to the epiglottis Palpation proved that the tumor was not exactly in the midline that it

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Micro copi ect f il gu l thyro d

extended more to the right than to the left semi elastic in consistence and not giving one the impression of a cystic condition but rather of a functioning glandular mass

I could not be certain that the lateral lobes of the thyroid were present in the neck—but at the operation there was no trace of an isthmus

The diagnosis lay between a lingual goitre and a dermoid cyst A chronically inflamed lingual tonsil could be ruled out—as it is an affection belonging to the middle period of life is always associated with pharyngeal dysesthesia and instead of the circumscribed smooth surface of this tumor nodular elevations exhibiting a well marked umbilication are found

Storrs states that a dermoid cyst in this position is generally yellow grows rapidly pits on pressure and has not the vascularity of goitre

Operation May 14 1907

Dr Grubley gave the anæsthetic—chloroform at first on a mask and then through a tracheotomy tube Dr H B Devine my house surgeon assisted

On account of the great vascularity of the growth and of the difficulty of working in so confined a field it was thought advisable to do a preliminary tracheotomy especially so in the event of the tumor proving to be her only supply of normal thyroid tissue Christiana's method of thyroid grafting as quoted by Lannelougue would have been compulsory or else implantation of thyroid tissue into that of the spleen

The mouth was gagged the tongue well drawn out with silk thread and the pharynx plugged with a sponge The mucous membrane at the base of the tumor was much hypertrophied and was freely incised The growth was now enucleated by means of the finger and scissors a small bridge of tissue at the base being left

The bleeding was extremely free but was controlled by sponge (on holder) pressure against the base of the tongue until three deep silk sutures could be inserted—a rather difficult *manœuvre* in such a position

The tracheotomy tube was now withdrawn two catgut sutures closing the opening in the trachea completely

It was found that a small thyroid was present in the normal position A few superficial sutures completed the operation For

four days the pulse rate varied from 140 to 120, but since then it has remained the same as before the operation, and on the fifth day she was up and about the ward—and discharged on the eighth day. So far (June 25th) she has remained perfectly well.

Report by Dr R J Bull on the microscopical examination of the goitre

The tumor was roughly bilobed, rounded, of about the size of a walnut, and of firm elastic consistence. Microscopically it consisted of more or less typical glandular thyroid tissue divided into lobules by a delicate lowly-cellular fibrous matrix in which blood-vessels and lymphatics were a prominent feature (Fig 2). The colloidal material was confined to the acini which were lined throughout by cuboid epithelium. As a result probably of imperfect absorption many of the glandular spaces were markedly cystic, the specimen resembling in this respect one of the types of goitre (cystic colloid). In addition to colloid matter many of the larger spaces particularly contained extravasated blood.

The operative procedure can be shortly summed up, thus—shell it out as you would an enlarged prostate and then stop the bleeding.

From the literature at my disposal it would seem that Wolf in 1882 at the German Surgical Congress first drew attention to the real nature of these tumors.

Chamisso collected about 18 examples. Others have been recorded by Benjamins, Watson, Leweles.

Seldowitsch saw a myxedema develop after the extirpation of an accessory thyroid tumor at the base of the tongue.

Collins Warren described in the Journal of the A M A a case of goitre at the base of the tongue in a woman fifty-two years of age.

Bernays of St Louis reports a case where the bulk of the tumor was in the substance of the organ.

Butlin records two similar cases in the Clinical Society's Transactions, vol xxiii, p 118. Schadle, Journal A M A, 1899, August 12, removed one from the tongue of a woman aged 25.

REPORT OF A CASE OF SARCOMA OF THE THYROID

BY EDGAR A VANDERVEER M D

OF ALBANY N Y

Att d g S geo t th Alba y H p tal

SARCOMA of the thyroid is of such comparatively rare occurrence that the report of the following case occurring during my surgical service at the Albany Hospital seems worthy of being placed on record

The history of the case is that of M H aged 70 white male born in United States married drayman by occupation He entered hospital complaining of a tumor on the right side of the neck

Family History—Father died of pulmonary tuberculosis mother died of pneumonia three brothers alive and well No history of growths of any kind in any of the relatives

Past History—Had the ordinary diseases of childhood had a fever when he was a young man which lasted two months Heart lungs kidneys bladder and stomach negative as to history Appetite good

Present Illness—About six years ago noticed a growth in the neck it began on the right side and appeared to be loose beneath the skin This gradually grew until it reached around in front at the same time gradually interfering with the breathing and the voice It remained quite loose and movable up to the present time

The size of the tumor may be judged by the accompanying photographs It had the appearance of a good sized cocoanut

After a careful examination of the tumor a diagnosis of a cyst of the right lobe of the thyroid was made and operation advised and accepted

The description of the operation is as follows

Upon examination patient presents an enlargement of the right side of the neck the size of two large oranges symmetrical throughout and fairly movable There is no pain but some

dyspnea and difficulty in breathing are experienced (see picture), Injection of a 1 per cent Novocain solution was made along the most prominent part of the tumor for a distance of some seven inches, in a curvilinear manner, from the mastoid to the mid-line of the neck at the sterno-clavicular junction. An incision was made following this line of injection, and superficial muscles were found very much thinned. On the anterior portion of the tumor were nodules seemingly aneurismal in character, from the external appearance. Incision of one of these nodules gave a large amount of hemorrhage. There were many adhesions enclosing the mass, and much severe hemorrhage from the breaking up of the same. The last portion of the tumor to be removed was deep down behind the right clavicle at its inner third. During the operation traction upon the mass gave severe dyspnea. By reason of the depth of this mass at this point it was deemed dangerous to clamp off the many bleeding points at such a depth, so gauze packing was utilized, as well as one gauze strip in the upper angle of the wound. The wound was then closed with chromicized catgut, and the usual dry dressing applied. At one stage of the operation it became necessary to give chloroform and oxygen for a few moments because of the pain experienced in pulling up on the tumor. Further than this the whole operation was performed satisfactorily under local anæsthesia.

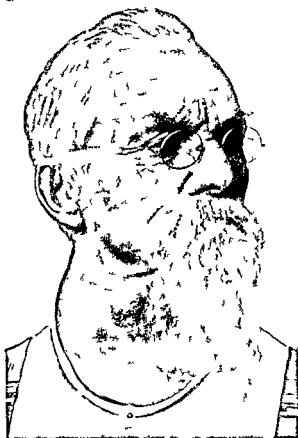
Patient rallied well from the operation, the temperature at no time going above 101° . The second day after the operation the pulse reached 120° , but that gradually reached normal, and the patient was allowed to leave the hospital at the end of twenty-one days, with the wound thoroughly healed, breathing excellent and voice firm and vigorous.

The report from the Laboratory was that of fibro sarcoma of the thyroid gland.

The literature on the subject of growths of the thyroid is fairly abundant, but at no time have I been able to obtain a satisfactory article on sarcoma of this gland.

For a man of his age he stood the operation remarkably well. When we consider that he was seventy years old, and had been a man exposed to the elements more or less all his life, and that this tumor was of six years' duration, a speedy recovery from the shock seems remarkable.

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S re m fthy d F w

FIG 2



Sarcoma of thyroid Lateral view



Sa f thyr d ppea f k f f b gr h

FIG 4



Sarcoma of thyroid, gross appearance of tumor after removal

NARATH'S MODIFICATION OF TALMA'S OPERATION FOR HEPATIC CIRRHOSIS

BY EUGENE R. CORSON M.D.

OF SAVANNAH GA.

NARATH'S modification of the Talma operation has not attracted any attention in this country¹ whether it has been taken up in Germany or not I am also unable to say. Narath's original paper I have not been able to get. It was first brought to my notice by a short excerpt in the *Medical Record* which reported the results in 11 or 12 cases with a brief description of the operation itself. According to this report the operation was very simple done under local anesthesia and followed by remarkably good results. Through a small incision in the mid line below the ensiform cartilage the peritoneum is opened a bunch of omentum is picked up drawn out and tucked under the skin and stitched in place with a few catgut stitches. The incision in the abdomen is carefully sewed around the base of the omental mass sufficient to close the abdomen yet avoiding any constriction of the omental tissue itself. The abdomen is carefully closed in layers as is now the custom. The operator as he sees fit may do a one sided operation or he may pick up a second bunch of the omentum and stitch it in on the opposite side should he think it necessary to increase the area of transplantation. According to Narath the subcutaneous veins become prominent in a week and the relief to the obstructed portal circulation is at once apparent. He reports no case of hernia and writes enthusiastically of his method.

There are two points in this operation which impressed

The only allusion to it I have seen occurred at a discussion on the Talma operation at the New York Academy of Medicine Nov. 16, 1905 when Dr. Franz J. A. Toec reported a successful case which was practically Narath's operation.

Über subcutane Verlagerung des Omentum. *Zentralbl. f. Chir.* No. 32

me favorably, namely, its simplicity, and most important of all, the direct implantation of the omentum subcutaneously, for nature seems best able to perfect a collateral circulation through the superficial veins

It is only within recent years, comparatively speaking, that anatomists have worked out thoroughly the relationship, the sites of anastomosis, between the portal and systemic circulation. As bearing so vitally upon the problem before us let me briefly summarize the results of modern research on this anatomical point. In a paper by Dr. Rolfe Floyd in the *Medical Record* for July 4, 1903, entitled "The Anatomy of Portal Anastomosis," the whole subject has been most admirably set forth and I shall quote largely from it and reproduce two of his instructive diagrams. There are several points of interest in Dr. Floyd's paper bearing on the subject. He writes: "I have found no record of a case of failure of complete closure of the ductus venosus with a secondary enlargement of this vessel in portal obstruction, and so far as I know, this vessel never supplies a channel of portal anastomosis in the adult." It would be interesting to know if any cases have been reported of the non-obliteration of the ductus venosus. Nature has evidently safeguarded this structure with unusual care, as she does not prove so careful with some other foetal organs. Again, according to our author, there has been some dispute as to the complete obliteration of the umbilical vein. "Sappey, '83, stated that all cases reported as patent umbilical veins, secondarily enlarged and furnishing an anastomotic channel in portal obstruction, were, in truth, not such, but enlarged veins running parallel with the round ligaments, and that the latter structure could always be demonstrated in such cases, in its usual adult condition. Baumgarten, '77, however, had stated that with the microscope he had found a minute central venous canal in the round ligament in fifty-four cases out of sixty, and that this canal became dilated in portal obstruction. Wertheimer, '86, looking into the matter somewhat more deeply, found that the narrowed lumen of the vein was completely occluded shortly after birth by a plug of connective tissue, and

that subsequently within a year or two in the majority of his cases nine out of sixteen a venule appeared in this central plug which communicated with the small veins coursing on the surface of the round ligament. This central venule penetrated the round ligament from its attachment to the abdominal wall to its junction with the still patent region within the liver. This venule was occasionally double or broken into a fine venous net. At the same time he reported three cases of portal obstruction in one of which the round ligament was not enlarged and contained no central venule, while in the other two there was a distinct enlargement of the round ligament as a whole and an increase of the central channel to eight times its usual diameter.

Thus it appears that in some cases at least the umbilical vein may be reclaimed in this roundabout fashion to its function as a blood vessel and form a channel of communication between the portal and systemic veins.

Dr Floyd mentions four normal sites of anastomosis between the portal and systemic veins in the adult.³

1. Anastomosis at the lower end of the œsophagus. The coronary vein of the stomach receives radicles from the lower end of the œsophagus which lie chiefly between the mucous and muscular layers of its wall. The same region is also drained by veins which pass to the phrenic veins and so to the inferior cava and by veins which unite to form the inferior œsophageal tributaries of the azygos veins and so enter the superior cava (Fig 11). In the body which I dissected in connection with this paper the two most evident veins in this region were the coronary vein and a lower œsophageal vein which passed to the vena azygos major.

2. Rectal anastomosis. The hemorrhoidal venous plexus lies between the muscular and mucous coats of the rectum. It is drained above by tributaries of the inferior mesenteric vein of the portal system laterally by rectal veins which enter the internal iliacs and below by the inferior hemorrhoidal veins which pass to the internal pudic veins and so again to the

internal iliacs (Fig 1 2) This plexus thus constitutes a pretty free anastomosis between the portal and systemic veins In the

FIG 1

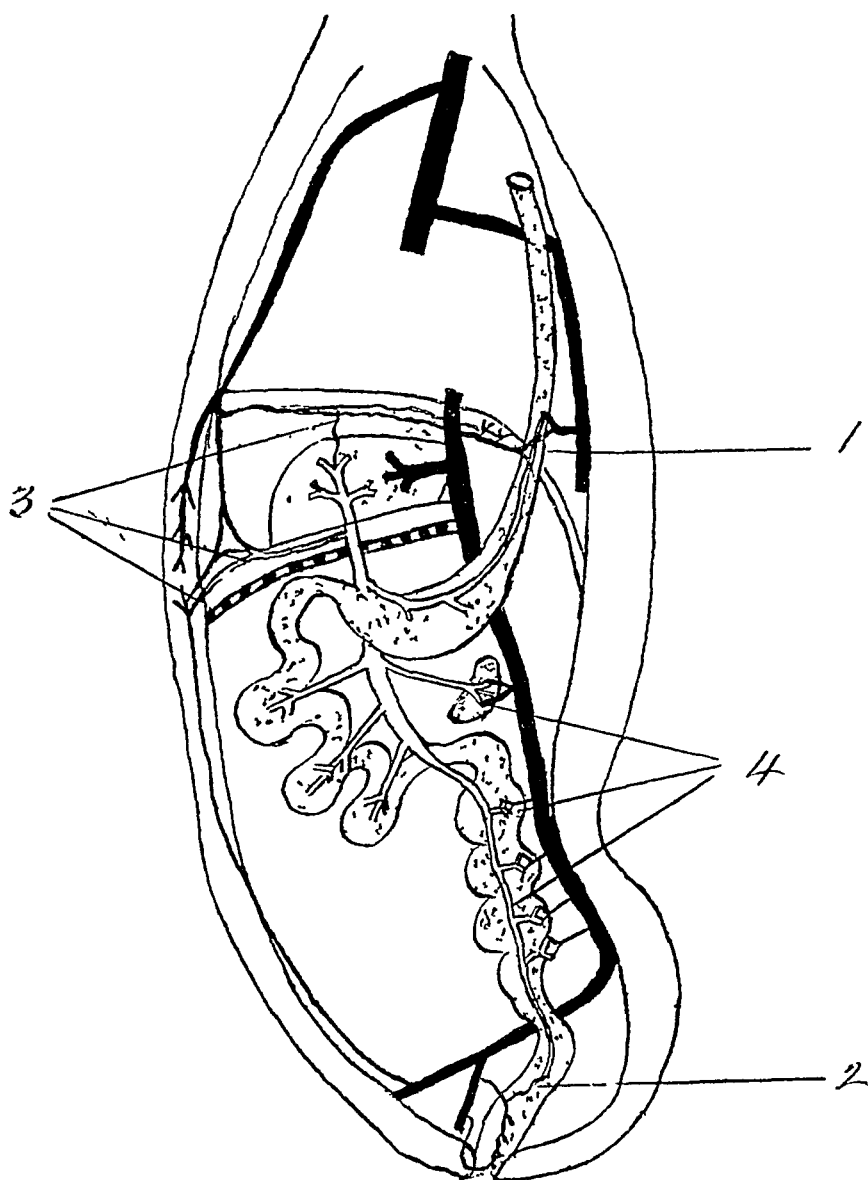


Diagram to show the sites of portal anastomosis in the adult, the portal system of veins is shown in outline, the systemic veins in black, the round ligament and ductus venosus in broken line, the viscera are indicated by thick dotting, the suspensory ligament by sparse dotting (Copied from Rolfe Floyd *Medical Record*, July 4th, 1903)

body which I examined injection mass thrown into the internal iliac passed into the inferior mesenteric vein establishing the fact of the anastomosis in that case beyond question

3 The accessory portal veins of Sappey These are veins in the suspensory ligament of the liver which establish anastomosis between the portal system on the one hand and the veins of the anterior abdominal wall and of the diaphragm on the other (Fig 13) Those which pass up to the phrenic veins take origin within the liver substance from small portal branches not from the portal trunk and emerge from the upper surface of the organ to enter the suspensory ligament Those which pass forward on the other hand root in the portal vein in the transverse fissure Some of these course along the surface of the round ligament while others lie higher up in the suspensory ligament These veins regularly connect with the veins of the anterior abdominal wall The situation of one of these veins in the centre of the round ligament has already been referred to In the body which I examined they united while still in the suspensory ligament with vessels derived from the internal mammary and deep epigastric veins

4 The retroperitoneal veins The duodenum the pancreas and part of the colon lie immediately against the posterior abdominal parietes and just as in any other continuous mass of tissue in the body the veins of these viscera, belonging to the portal system become more or less continuous with the systemic veins of the parietes (Fig 14)

These four sites are shown in Fig 1 In the second figure I copy from Dr Floyd's paper are shown the chief veins of the anterior abdominal wall which are of interest to us in the collateral circulation of portal obstruction He enumerates the following branches (1) Deep epigastrics tributaries of the external iliac (2) superficial epigastrics tributaries of the femorals through the saphenous (3) superior epigastrics tributaries of the internal mammaries (4) intercostal veins of the sixth to the ninth spaces tributaries of the azygos veins

These valuable researches of Dr Floyd point to the accessory portal veins of Sappey uniting freely as they do with the

anterior abdominal veins, as the chief site where nature is enabled to form a collateral circulation. Again, they seem to show that these accessory portal veins which pass forward should be more efficient for the new channel than those which pass up to the phrenic veins, as the former "root in the portal

FIG 2

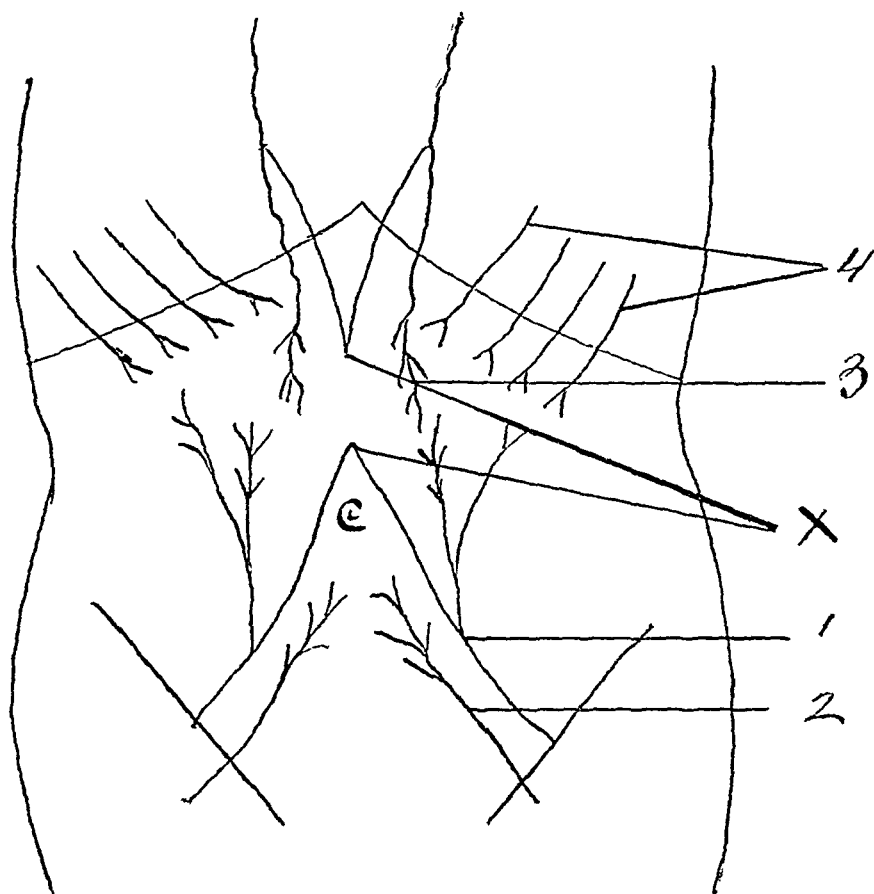


Diagram of the veins of the anterior abdominal wall, "1, deep epigastric, 2 superficial epigastric, 3, superior epigastric, 4, intercostal, λ branches from the internal mammary and deep epigastric veins which pass into the suspensory ligament (Copied from Rolfe Floyd, *Medical Record*, July 4th, 1903)

vein in the transverse fissure," while the latter "take origin from within the liver substance from small portal branches, not from the portal trunk" Therefore, uniting the superior surface of the liver to the opposing surface of the diaphragm, as

is done in the Talma operation is not so efficient as uniting the omentum to the anterior abdominal wall either by stitching it to the peritoneum or preferably as I believe by its subcutaneous insertion as in the Narath operation. In this way by bringing the portal vessels of the omentum in direct contact with the tissues in which these superficial abdominal veins lie a more direct collateral circulation is established. That there should be an evident enlargement of the superficial abdominal veins in a week after the operation shows how quickly nature has availed herself of this new channel.

To show nature's wonderful resources in the way of a collateral circulation by the superficial abdominal veins we can find no more signal example than in the case of obliteration of the superior vena cava so minutely described by Professor Osler in the *Bulletin of the Johns Hopkins Hospital* for July 1903. The paper is well worth reading in connection with our present subject. In this case nature was enabled to carry the venous blood from both arms and the head back to the heart through the superficial veins of the chest and abdomen reaching the right auricle by the azygos and the inferior vena cava.

While I have but one case of Narath's operation to report the signal success I obtained under the most adverse conditions prompts me to publish it in the hope that the operation may have the extended trial I think it deserves. I first saw the patient in question in the fall of 1904 and operated in January 1905 and as he writes me of continued improvement up to the present time eighteen months after the operation I feel that a sufficient length of time has elapsed to show the value of the procedure.

G. M. white single *aet* 43 shows a good family history. He had a severe typhoid fever when 22 years old which nearly resulted in his death. When 36 years of age in Cuba in the Spanish American war he had dysentery malaria yellow fever and ascites. Under the treatment of the army surgeon he apparently recovered. The ascites did not return till June 1904. Patient has had gonorrhœa several times he has used intoxicating

liquors in moderation up to the time he went to Cuba when he used them to great excess. In September, 1904, he had a Hunterian sore, followed in six weeks by pronounced secondaries all the typical symptoms, roseola, a papular syphilid, sore throat, fever, bone pains, and alopecia. I saw the patient first early in October before the secondaries appeared. He had pronounced ascites at the time, his face had the characteristic drawn expression of abdominal distension, he was thin and somewhat jaundiced, the urine showed a trace of albumin, altogether he presented a clinical picture well nigh hopeless. I ordered him into the hospital. I lost sight of him till December when he was brought to my notice in the ward, with some secondaries still out on him, and under full specific treatment. On December 29th he was tapped by the house-physician who removed two gallons of fluid. This rapidly re-accumulated. I operated first on January 4th, under general anæsthesia. I made a median incision about four inches long below the ensiform cartilage and let out nearly two gallons of fluid. Palpating the surfaces of the liver I made out a cirrhosis in its most advanced stage. Without exaggerating I can only liken the sensation to the examining hand of a bag full of marbles, so pronounced was the bosselation, if I may coin a word. The gall bladder seemed normal. I tucked a bunch of omentum under the skin on the right side, spreading it out as much as possible. I carefully sewed around the base of the omental mass and closed the abdomen in layers. There was no reaction from the operation. At the end of a week there was a distinct increase in the size of the abdominal veins, as described by Narath. The abdomen however, filled up rapidly again, and on January 30th I repeated the operation, letting out an amount of fluid quite equal to the previous tapping. This time I tucked a bunch of omentum under the skin on the left side just below the first omental graft and closing the abdomen as before.

After this second operation the patient almost immediately expressed himself as feeling better. Though there was an evident re-accumulation of fluid, it was neither so rapid nor so extensive. He was up and about walking in the hospital grounds. An improvement was evident to all who were watching the case. He was not tapped again. He shortly left for the National Soldiers' Home in Tennessee where he was offered a home, and he has

remained there ever since. He has regularly written me short accounts of himself all indicating a gradual improvement.

In a letter dated July 8 1907 he writes: "My abdomen is still swollen some but the surgeon here says it is from gas and there is no water or very little in the stomach. My strength has improved a great deal in the last three or four months and I sometimes take walks of two or three miles distance. After exercising a good deal during the day my ankles swell a little but go down again before morning. My appetite is very good although my food consists mostly of milk and toast as this seems to agree with me best. I sleep extra well except I dream a good deal." Where the incisions were made by the operation I suppose I am ruptured there as they extend out about two inches when I am not using a bandage. I wear this bandage all the time. The veins on my stomach are very prominent and I am short of breath when going up grade. The greatest trouble I have is in trying to climb upon something about three or four feet high as a box. My bowels do not act regularly and I have to take a good deal of purgative medicine every day or two. When I press upon the outside of the incisions on my abdomen it feels sore inside. My weight is 151 pounds.

Considering the condition this man was in at the time of operation and complicated too by syphilis in its secondary stage the result obtained by this operation seems to me remarkable. In the few cases I have seen reported of successful Talma operations the patients have undergone repeated tappings until the collateral circulation was equal to the emergency. In this case the collateral circulation seemed to have been established quite rapidly. Whether there is a real hernia in addition to this double epiplocele I of course cannot say without examining my patient. Before he left the hospital the epiplocele was very evident on inspection probably rising a half inch above the skin. It is possible that the enlargement in the omental vessels may be sufficient to account for the increase in the protuberance.

The success attained in this advanced case would point to

Is this the result of the brain getting portal blood which has not been cleared by passage through the liver?

a much greater success for the operation if done in the beginning of the cirrhotic process. It would be interesting to know if there has been any improvement in the condition of the liver, a reduction in the fibrosis. I am inclined to think that nature has accomplished something in this direction. We do see it in other forms of fibrous proliferation.

The Talma operation has a considerable mortality, never less in all cases than 10 per cent, and where the cirrhosis is advanced this mortality is greater. I think it is a mistake to leave any open drainage for the ascitic fluid, as infection is bound to occur sooner or later. The mortality of Narath's operation must be little or nothing. As the majority of these cases do not get to the surgeon before the disease has reached an advanced stage and any serious operation is very risky, the simpler operation of Narath's offers the best chance for help, even with the inconvenience of an epiplocele and a possible hernia. The chances of this latter complication do not seem to be great. The position of the epiplocele is not favorable for hernia, and the transplanted omentum must act as a plug against the protrusion of the gut.

ACUTE PANCREATITIS

WITH REPORT OF TWO CASES.

BY WALTER A JAYNE M D

OF DENVER COLORADO

Prof of Gynecology and Abdominal Surgery Medical Department University of Denver

It was in 1889 that Dr Reginald Fitz published his monograph on acute pancreatitis and forcibly calling the attention of the medical profession to its various forms gave that masterful description which has since been the classic to which we turn when we study this disease. He told us at that time that it occurred more frequently than was generally thought and ten years later Mr Mayo Robson made the same statement as the result of his large surgical experience. Time has proven that these assertions were amply justified. In recent years pancreatitis has excited an increasing interest. Many articles of the greatest value appearing in our medical journals have made us more familiar with its manifestations and the more frequent reports of cases observed and treated surgically suggest that instead of being overlooked it is coming to be more commonly recognized.

The location of the pancreas is obscure and the difficulties of diagnosis from the symptoms alone are so great that the presence of pancreatitis is seldom determined in advance of operation or a demonstration at the dead house table. The violent acute forms are not so common as to force themselves upon the watchfulness of the general practitioner. We must believe that milder forms occur with considerable frequency and subsiding without notable incident or followed possibly by a moderate and late induration the true nature of the attack escapes recognition and is ascribed most plausibly to acute indigestion gall stone colic or if prolonged to gastritis.

We know that the pancreas is one of the most important organs concerned in digestion and that the large proportion of our food is dependent upon the chemical action of its secre

tions for preparation for successful assimilation and the proper nutrition of our bodies. Physiologists tell us that normally the pancreas produces certain enzymes,—the amylolytic, the lipolytic and the proteolytic,—each varying in amount, responding to demand, and adapted to the breaking up of the class of food indicated by the name, and, that it controls the carbohydrate metabolism, whether directly by some internal secretion or otherwise is not yet clear.

Since the secretions of the pancreas take so prominent a part in the chemistry of digestion, it has been confidently expected that the excretions, upon careful analysis, would yield positive evidences of the interference with or interruption of its functions, we have assumed to be incident to disease, whether acute or chronic, and give definite guides to diagnosis. Notwithstanding diligent search such evidences have yet proved so elusive inconstant and uncertain as to afford us no sure guide when most urgently needed, and we have helpful suggestions only, occasionally present in the later stages of acute disease, more frequently in the chronic and malignant forms. In acute pancreatitis, therefore, and too often in chronic induration, cystic and cancerous disease of the pancreas we must still depend upon the clinical manifestations at the bedside for our diagnosis, unless indeed an exploratory incision gives us the demonstration. We should be watchful, however, for such chemical or microscopical evidences as may occasionally occur. If we may assume that the pancreas is incapacitated for all function at once upon the onset of an acute inflammation, the explanation of the absence of corresponding indications in the excretions may be found in the fact that the contents of the stomach are promptly ejected, and no food is taken for some days at best, not until by happy chance, convalescence is in some degree established. A further reason may be, as Fitz has stated, that "the functions of the pancreas are not the exclusive property of this gland but are possessed to a greater or less extent by other structures and other agencies," and the evidences are obscured.

During the past ten years surgery has extended its field

of activity to the upper abdominal cavity and the opportunity thus afforded to study the diseases of this region in place instead of in the dead house only has assisted in shedding valuable light on the ever varying symptom complex these diseases present for our analysis and has materially advanced our diagnostic ability. This experience has demonstrated that diseases of the pancreas are neither so very rare or necessarily unrecognizable and that with better acquaintance acute pancreatitis may often be determined without exploratory incision.

The subject is not fully understood and the diagnostic indications are seldom clear. Many problems theoretical and practical remain to be solved and each case observed is therefore of especial interest. With the hope of aiding in the further elucidation of acute pancreatitis I beg to report two cases which happen to have come under my care during the past year.

CASE I Mrs ——— aged 33 of good physique weight 135 pounds had never had any illness of moment. Previous health excellent except that for two months prior to her present illness she had had slight intestinal indigestion characterized by epigastric discomfort and distention after eating for which she had been under treatment. August 2nd feeling particularly well on rising she was seized with a sharp smarting agonizing pain at the epigastrium as she was entering her bath prostrating her to the floor and followed shortly by nausea and vomiting. Dr H W Hoagland of Colorado Springs saw her about an hour later. She was suffering severely face bluish pulse 82 temperature normal no shock abdomen tender and slightly tympanitic. The pain was temporarily relieved by morphia with atropia but later returned being dull and persistent accompanied by nausea and vomiting. Evening pulse 84 temperature 99.5. The next day pulse 76 temperature normal expression good. The third day morning pulse 100 temperature 99.6. The nausea and vomiting had persisted and notwithstanding repeated cathartics and enemas the bowels had not moved. During the afternoon she became worse pulse 120 temperature 100 abdomen greatly distended tympanitic and tender.

With Dr Hoagland I saw her sixty three hours after the

attack The face was grayish, expression anxious, tongue coated, pulse 130, temperature 100.5, abdomen large, tympanitic and very sensitive, especially at the epigastrium and extending to the left hypochondrium, with resistance and suspicion of a deep-seated mass The diagnosis lay between acute obstruction of the bowels from unknown cause, acute pancreatitis, and perforating ulcer of the stomach or duodenum The known previous history did not suggest ulcer and perforation was therefore considered improbable The condition was grave, peritonitis impending if not already present, and immediate exploratory incision was decided upon While preparations for operation were being made the bowels moved voluntarily and copiously and again an hour later after enema The discharge was liquid, ashen gray, offensive, and to the naked eye contained no fat or undigested food The patient was so greatly relieved that operation was not advisable The nature of the attack was left in question, but as acute pancreatitis remained as the only probable and sufficient explanation she was watched for confirmation of this tentative diagnosis

Although relieved of urgent symptoms the patient was left exhausted, lethargic, and confined to bed with an undefined discomfort at the epigastrium, tongue furred and disinclination for all food For ten days her condition remained about stationary, pulse from 96 to 120, temperature normal or subnormal, abdomen large, tympanitic, sensitive, resistant and palpation unsatisfactory but with increasing suspicion of a mass From the eleventh to the sixteenth day the evening temperature ran from 99 to 99.4 On the thirteenth day an embryo of one month was discharged From the sixteenth to the nineteenth day the evening temperature varied from 100.4 to 101 The abdomen was softer and though still distended an epigastric mass could be distinctly felt Deep-seated, it appeared to be about the size of a flattened orange Abruptly terminating an inch to the right of the median line it seemingly extended beneath the ribs on the left, but was separated from the liver by a distinct space During the next four days the temperature declined each evening until it reached 99.2, pulse averaging 100, and the patient became stronger and brighter, with an improving appetite On the evening of the twenty-fifth day she was seized with a chill followed by vomiting, pulse 120, temperature 100.4 The next morning the temperature was above 99 for the first time, registering 101.5 Examination showed the

mass to have increased in size. It was pushing to the right and upward to the liver and was very tender. On the twelfth day a blood count showed a leucocytosis of 11 000 the twenty second day 15 000 and on the twenty seventh day 30 000 no differential count being made. Examination of urine and feces had been negative the urine now showed positive reaction for acetone and diacetic acid.

After consultation in which Drs Gardiner of Colorado Springs Isaac Adler of New York Freeman and Powers of Denver joined the diagnosis of abscess of the pancreas was concurred in and an exploratory incision was determined upon.

Operation September 19th four weeks from date of attack Drs Freeman and Powers assisting. Incision at the epigastrium five inches in length through the right rectus one inch from its inner border. On opening the abdomen disseminated areas of fat necrosis were found in the omentum. The mass five inches in diameter lay behind the stomach extended about three inches to the right of the median line approached the liver and was attached to all adjacent structures by adhesions. The gall bladder and common duct were uncovered as far as was deemed safe without opening the abscess but sufficiently to demonstrate their healthy condition and the absence of gall stones. The peritoneal cavity being protected by gauze the gastro-colic omentum was opened and by blunt dissection in a direction upward and backward at the depth of a finger's length a pocket containing about eight ounces of thin grayish pus was discharged and further exploration opened two smaller subsidiary pockets in the substance of the gland. The pus cavity having been wiped dry a large (five eighths inch) rubber tube protected by gauze was passed to the bottom of the abscess and fixed by suture packing removed and the upper two-thirds of the incision closed by layer sutures. But little shock followed and the patient improved from the first making an uneventful recovery until the sixth week. Dr W C Mitchell reported the pus taken at operation as giving a pure culture of the colon bacillus.

She was placed on the right side to favor drainage which for the first four days was very copious saturating the large dressings in a few hours and then became less purulent diminished in quantity and at the end of a week it had become a free discharge of a thin clear watery alkaline fluid of sweetish odor evidently

pure pancreatic juice. Wherever the discharge came in contact with the skin it caused a sharp dermatitis, and the wound became red, swollen and appeared about to suppurate, but on the removal of the sutures on the sixth day complete primary union had taken place. Repeated enemas of a solution of sodium bicarbonate were given for several days following the operation on account of the acetone and diacetic acid in the urine, which finally disappeared on the tenth day. The granulations, seemingly stimulated by the pancreatic juice, rapidly filled the wound which was reduced to a narrow fistulous track, and on the fourteenth day, the discharge no longer containing pus, the tube was removed. The discharge continued free until the night of the twenty-first day after operation when it abruptly ceased and the next morning the wound was permanently closed.

During convalescence the diet, consisting of broths, fowl, meats and toast, was generally well taken care of, occasionally, however, meat fibres appeared in the stools. The strength returned steadily and by the sixth week she was about the house and driving out. Examination showed the scar sound, abdomen soft, no tympanites, no tenderness. Little or no induration at the head of the pancreas could be felt on deep palpation, though the abdominal wall was attached to its location.

After unusual fatigue the previous afternoon, at ten o'clock of the fortieth day following operation, a light breakfast having been taken, she was seized while still in bed with a dull aching and later a smarting pain at the epigastrium, with nausea, increasing in severity during the afternoon and evening. At 4 P M the pain was located under the cicatrix and described as of the same character as the original pain. The facies were good, pulse and temperature normal. Through the lax abdominal walls immediately beneath the scar at the location of the head of the pancreas a firm, tender mass, about the size of a small flattened orange could be readily palpated. An enema brought away some feces with undigested food (meat and peas) eaten the previous day. During the evening she vomited, the pain became severe and three hypodermics of codeia and morphia were required for relief. The following day the pain though present was bearable, nausea persisted and large quantities of bile were vomited and the mass was decidedly larger and very sensitive. By evening the pulse was 120, vomiting persistent, and the abdomen was becoming dis-

tended and tympanic. Repeated enemas had no result until at midnight when the bowels moved freely giving prompt and final relief. The following day she was again convalescent but the enlargement of the head of the pancreas diminished slowly and it was three weeks before it could no longer be felt. Five weeks later she had an attack of epigastric pain of similar character lasting twenty four hours but without nausea and relieved by continuous warm applications. She was not seen by a physician at this time. There have since been no symptoms referable to digestion or the pancreas and the general health has remained excellent.

CASE II—Mrs. — aged 65 never had an illness robust and in good health weight 170 pounds. At 10 30 A M February 10th after an unusually hearty breakfast she was seized with vomiting followed immediately by a sharp pain under the right shoulder blade passing rapidly to the epigastrium. Dr. H. T. Pershing saw her a few moments later and making a diagnosis of gall stone colic gave a hypodermic of morphia with atropia. The pain was relieved but returned after a few hours continued during the night and becoming severe toward morning another hypodermic was given. She was referred to me and at noon the pulse was 90 temperature normal no pain nausea and slight tenderness at the epigastrium. After a restless night she complained of gastric distress nausea occasional vomiting thirst no pain. Tongue dry coated pulse 120 and quick temperature 100 epigastrium slightly distended resistant sensitive to pressure and on deep palpation a small firm flattened mass could be felt at the location of the head of the pancreas. The following day the vomiting was persistent nourishment by mouth was supplemented by salt solution and nutrient enemas. Conjunctival but no cutaneous jaundice. The fifth day she was worse general restlessness gastric distress thirst nausea and vomiting. Tongue furred and dry pulse 116 epigastric distention and sensitiveness increased mass distinctly larger. Urine of yesterday and to day examined by Dr. W. C. Mitchell who reported color reddish specific gravity 1033 acid no albumen sugar pentose arabinose indican Cammidge's crystals (*Surgery Gynecology and Obstetrics* September 1906) or fat splitting ferment (*Opie Bulletin of J. H. Hospital* May 1902) diazo negative bile pigments positive. Blood count by Dr. J. C. Todd reds 4 000 000 slight poikilo-

cytosis, leucocytosis 16,800, differential count, lymphocytes 88, transitional forms 6, polymorphonuclears 85, eosinophiles 02 per cent On the morning of the seventh day she was seized with a lancinating pain at the margin of the left ribs, interfering with breathing, and of diaphragmatic origin, complained of epigastric fulness and weight which made lying on the back uncomfortable and movement in bed difficult Tongue coated and dry, nausea but no vomiting, nutrient enemas stopped, pulse at noon 128, temperature 100.4 Epigastrium prominent, resistant and the mass as large as a medium sized grape fruit readily felt and very tender In consultation Dr Leonard Freeman concurred in the diagnosis of acute pancreatitis with possible commencing pus formation Dr Todd reported on the blood taken at the same time, slight poikilocytosis, leucocytosis 14,500, differential, lymphocytes 16.5, transitional forms 8.2, polymorphonuclears 74.5, eosinophiles 0.8 per cent, a suggested improvement not corresponding to the clinical evidence Two days later her condition was improved, though gastric weight and discomfort continued, nausea had ceased, pulse 110, mass unchanged Blood count, slight poikilocytosis, leucocytosis 13,500, differential, lymphocytes 14, transitional forms 6, polymorphonuclears 79, eosinophiles 0.75, mast cells 0.25 per cent Urine, trace of albumen, few hyaline casts, otherwise negative Twelfth day, patient improving, taking liquid nourishment well, still complains of weight at epigastrium, abdomen softer, mass firm, less tender, somewhat smaller, pulse 110 Blood count, slight poikilocytosis, leucocytosis 9,500, differential, lymphocytes 17.2, transitional forms 6, polymorphonuclears 76.4, eosinophiles 0.4, mast cells 0.2 per cent Urine faint trace of albumen, otherwise negative Examination of feces by naked eye, negative until convalescence, when meat fibres were occasionally found The temperature throughout varied very little, ranging from 99 to 100.4 It reached 100 on the morning of the third day, and 99.8 to 100.4 on the evenings of the fifth, sixth, seventh and eighth days

From this time the patient made a slow but uninterrupted recovery When she passed from observation six weeks after the beginning of the illness she was anæmic, feeble and just able to travel Digestion good on a diet restricted to fish, meats, fowl, eggs and toast The head of the pancreas was still easily mapped out by deep palpation as a flat, hard mass, lying deep at epigas-

trium and insensitive except on firm pressure. Recent reports state that in August she had an attack of what was diagnosed as gall stone colic while on her way to Carlsbad from which she promptly recovered and that her health is slowly becoming re established.

While it would appear that these cases are fair examples the one of acute suppurative pancreatitis the other of acute pancreatitis with resolution they present several features of unusual interest.

Etiology—Mr Mayo Robson attributes acute attacks of pancreatitis to the invasion of bacteria the infection almost always entering through the ducts (*Lancet* July 28 1900) Flexner Opie and others have shown by animal experimentation that bile gastric juice and other substances act as irritants when thrown into the pancreatic ducts and produce violent and fatal inflammation of the gland (Transactions of the Congress of American Physicians and Surgeons vol vi) We know from clinical observations that pancreatitis both acute and chronic is often associated with cholelithiasis. Opie has apparently demonstrated at autopsy following acute pancreatitis in the human subject that the retrojection of bile had in that case produced the disease and explaining the mechanism by which it may occur when a gall stone is lodged in the diverticulum of Vater urged this as a common cause of this disease (*Bulletin J H Hospital* 1901 xii 182).

After a careful study of the above cases it is believed that we are justified in assuming that they illustrate as far as may be both of these theories of causation. Case 1 was preceded by gastro intestinal derangement inflammatory or catarrhal a condition associated with bacterial activity. There had never been nor was there during the progress of the case any jaundice bile pigment in the urine or other symptom suggestive of cholelithiasis and although the pancreatic portion of the common duct only was not examined at the operation the remainder of the bile passages were so absolutely normal as to fairly negative the assumption of the presence of a gall stone at the diverticulum of Vater. The pus at operation yielded a pure

culture of the colon bacillus. These facts point sharply to an ascending infection from the duodenum.

In the second case we have positive evidences of disturbance in the bile passages, the primary pain was typical of gall-stone colic, bile pigments in the urine and the jaundice point to a cholangitis, local evidences of pancreatic involvement did not occur until nearly forty-eight hours later, the pancreas though swelling rapidly to large proportions passed to resolution within the week, all suggestive of an inflammation from a violent irritant, quite possibly from the retrojection of bile into the pancreatic ducts as set forth by Opie.

Clinical Course —The symptoms in the first case are very closely in accord with the classical descriptions. The sudden, sharp, agonizing pain at the epigastrium, shock more or less pronounced, nausea and vomiting, motor insufficiency of the intestines, distention and tympany, threatening peritonitis, rapid pulse with moderate temperature form a symptom complex by no means characteristic of acute pancreatitis, which may be presented by several other conditions. Careful physical examination unless made before tympany and rigidity occur, is incomplete or unsatisfactory, and a moderate epigastric tumor may easily escape detection, as was probably the case here. The relief obtained when the bowels finally moved was apparently so complete that for several days the expectation of convalescence appeared fully justified. The lethargy, lack of appetite, furred tongue, continued rapid pulse out of proportion to the temperature or apparent condition, epigastric discomfort without pain, made up the clinical picture until the evening rise of temperature created suspicion of sepsis and abscess formation. About this time the subsidence of tympany and resistance permitted the mapping out of the circumscribed mass, which previously had been indistinct, and thereafter its development could be closely followed until the local indications, taken with the pulse, temperature, and blood count, confirmed the original diagnosis and completed the diagnostic picture for those who had had the opportunity to follow the case.

The subacute attack following so closely upon the demonstration at operation left no question as to its nature. The condition of the pancreas is known to have been negative a few days before yet within six hours after the apparent inception of the attack the abdominal walls being lax and deep palpation easy the gland was found to be very considerably enlarged firm and not particularly sensitive leaving the impression that the swelling must have commenced some little time previous to the symptoms or have taken place with surprising rapidity. It is of interest to note the prompt and complete relief following movement of the bowels and to compare the almost equal relief similarly obtained on the third day of the original attack the prompt disappearance of the tenderness within a very few hours and the slow recession of the pancreatic swelling.

The most notable features of the second case aside from the original pain were the general anxiety epigastric discomfort and weight thirst persistent nausea jaundice a pulse rapid and quick out of proportion to the temperature and the very rapid and considerable enlargement of the pancreas the changes in which as in the relapse in the first case were watched closely at frequent intervals. The blood count was a most valuable diagnostic and prognostic aid. On the seventh day when all the clinical signs except the temperature seemed to indicate the imminence of conditions which would prompt operative interference and possibly the early breaking down of the gland and abscess formation and thereafter it gave an accurate forecast of the clinical condition observed forty eight hours later. During convalescence azotorrhoea occurred in both cases. Visible steatorrhoea occurred only once and then during convalescence from the relapse in the first case its absence possibly being due to the rigid exclusion of all fats from the dietary.

Diagnosis—In 1900 Mr Mayo Robson stated that although pancreatic disease is without pathognomonic signs the diagnosis can usually be arrived at by a careful study of the history mode of onset and the combinations of symptoms and signs. Fitz has said that acute pancreatitis is to be

suspected when a previously healthy person or a sufferer from occasional attacks of indigestion is suddenly seized with a violent pain in the epigastrium, followed by nausea and collapse, and in the course of twenty-four hours by a circumscribed epigastric swelling, tympanitic or resistant, with slight elevation of temperature," and in 1903 he said in effect that we have no evidence "which gives to the diagnosis more than a variable degree of probability" In Case 1 the combination of the history, character of the original attack, and local signs pointed most clearly to acute pancreatitis after the matter of poisoning, perforative peritonitis, and finally acute obstruction of the bowels, could fairly be eliminated Continued study of the developments in the case gave corroborative evidence of the diagnosis which was as positive as is possible in internal disease in advance of a demonstration at the operating or autopsy table The diagnosis of the relapse was practically made by the patient before being seen by a physician

In the second case the abdominal walls, though thick, were sufficiently lax on the first day to permit of a satisfactory deep palpation and the consequent knowledge of the ordinary local physical condition with the slight tenderness over the head of the pancreas to excite attention, and the later observations at frequent intervals, together with the history and symptoms led to a definite diagnosis All subsequent events tended only to confirm it, even to the remaining sclerosis, recognized independently by others after her return home

Treatment —In the early stages of an acute attack with definite pancreatic enlargement and condition threatening, exploratory incision with drainage of the peri-pancreatic space, with possibly punctures or incision of the organ for the relief of the congestion, has, in a goodly number of cases, been followed by prompt recovery, apparently as a direct result of the treatment Whether or not such treatment in the first case would have succeeded in averting the further progress of the disease and avoiding the subsequent suppuration we cannot say, but it should be noted that the condition was apparently not at all serious or threatening until the third day, when the bowels had not

moved and peritonitis appeared imminent. Then a voluntary movement of the bowels gave such evident relief that no interference was justified. The strictly medical treatment of the case appears therefore to have been eminently wise until the symptoms and the increasing mass pointed with almost unerring certainty to suppuration when surgical intervention became imperative. At the operation the general cavity was protected and the use of a large tube proved most satisfactory efficiently carrying off the profuse irritating discharges and later the pancreatic juice. The protection of the skin from the discharges was most difficult and at times impossible. The treatment of the relapse as of the second case was symptomatic consisting essentially in relief of pain moving the bowels by repeated enemas and later nutrient enemas and restriction of the diet.

Conclusion—The relapse in the first case and the second case here reported ending in resolution represent the milder forms of acute pancreatitis rather than the hemorrhagic gangrenous and suppurative we have heretofore studied. This gland is doubtless pathologically subject to the same varying grades of inflammation as other tissues of the body from simple congestion to the fulminating, often fatal types mentioned. The slighter pathological changes in an organ so deeply and obscurely placed must ever be difficult if not impossible of detection without other aids than we now have. However with a mind open to the fact that such milder inflammatory processes do occur in the pancreas appreciating that in the severer forms at least as Mayo Robson says a correct opinion can usually be arrived at we shall be more alert to its occurrence become better acquainted with its various clinical manifestations and succeed in recognizing acute and probably sub-acute pancreatitis much more frequently than heretofore.

PRIMARY FIBROMYOMATA OF THE BROAD LIGAMENTS.

BY JAMES VANCE, M D,

OF EL PASO, TEXAS

Formerly Professor of Bacteriology and Assistant to the Chair of Abdominal
Surgery, Hospital College of Medicine, Louisville, Ky

INTERLIGAMENTOUS development of fibromatous nodules originating from the uterus are common, but primary interligamentous fibromyomata, with no connection to the uterus either as to origin or development, are rare. So rare are these primary tumors of the broad ligament that for a long time pathologists did not admit their existence, and even yet there is confusion and uncertainty—even amounting to disbelief—in the minds of most operators as to the nature and existence of these tumors. It was thought for a long time that all such tumors originated from the uterus, that the nodule developing within the folds of the broad ligament became pedunculated and then gradually separated from the uterus by a narrowing of the pedicle till the separation was finally complete and the tumor assumed a purely interligamentous position, deriving its blood supply from the uterine and ovarian arteries within the broad ligament. But now, all doubt as to their origin is dispelled from the investigator's mind by a search of the literature on the subject.

Lack of knowledge in regard to these tumors is primarily due to their rarity, comparatively few surgeons ever encountering one, and secondly, to a lack of attention given these growths by the standard text books, the majority of which have nothing at all on this subject, and the rest containing such meager information as to not merit the attention of the busy worker.

Harpel¹ is of the opinion that these tumors are much more common than the few cases reported in literature would seem to indicate, and the writer is strongly of the same opinion, because a number of such tumors of primary origin, occurring associated with myomatous growths of the uterus, are over-

looked because they are regarded as having originated from the uterus which in the majority of cases is probably not true since in the first place it is very questionable whether a tumor originating from the uterus does not always retain sufficient pedicle or connection to the uterus to recognize its uterine origin in the second place the etiologic factors whatever they may be that cause the myomatous development of the uterus by analogy at least should be potent in the broad ligament also and as a matter of fact the larger proportion of these tumors reported are associated with uterine fibromata thus bearing out the above argument

It is only in the cases of broad ligament development alone associated with a perfectly normal uterus that the primary origin is so obvious as to compel the attention of the surgeon. Such cases are very rare there occurring only four in the past eleven years in American literature so that the author feels justified in a rather extensive report of the following case both because of the natural interest of the case and because it is such a beautiful and unmistakable specimen of primary fibromyoma of the broad ligament accompanied by a perfectly normal uterus

CASE REPORT—Mrs H aged 47 married 18 years two children aged 17 and 6 respectively family history good

Personal History—Usual diseases of childhood otherwise always strong and well Menstruation began at 14 was regularly established lasting four to five days She enjoyed perfect health till the birth of her first baby The labor was long and hard but delivery was normal She gave a history of fever after delivery and a week later she had an abscess in one breast and later an abscess in the other breast She was obliged to go to the hospital for treatment and remained there for six weeks She was fairly well she states two months after her baby's birth but she was obliged to go back to the hospital at the end of five months to be treated over a long period of time for ulceration of the womb No operation was performed

The second pregnancy occurred eight years later No miscarriages or abortions in the interval With this second child she

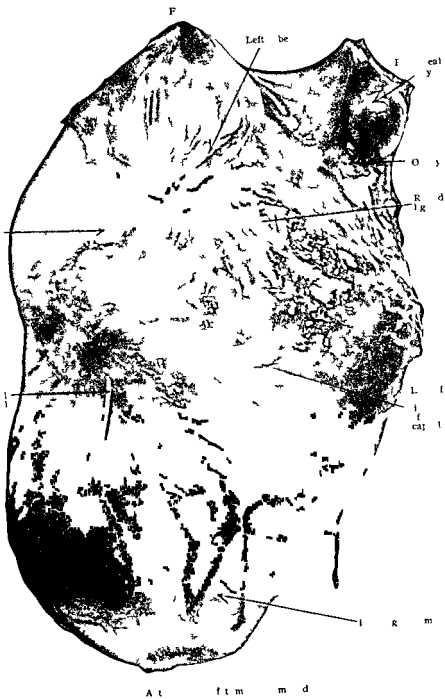
had a normal period of gestation and a normal delivery Her breasts were again sore, but no abscesses formed Later she was again troubled with "ulceration of the womb" She was not able to nurse either of her children

Present History—About three years ago the patient noticed some "bloating" of the abdomen, but thought nothing of it About a year ago she felt a "knot" in the right side above the pubes She suffered no inconvenience from this, however, and did not even consult a physician

During the past year there has rapidly appeared a "swelling" to the left of the original "knot" Menstruation during this time has been very irregular, both as to time and duration She has developed pain in the back and radiating pains down the thighs Frequent micturition has also given her great annoyance during past few months She has had "stomach trouble" for more than a year past and a great deal of "bloating" Bowels have been regular generally, but lately she has had several attacks of diarrhoea Appetite generally poor, but at times fair She has lost about twenty pounds in weight during the past year

Physical Examination, May 4, 1906—Patient is about 5 feet 4 inches high Her skin is very dark and dry Sunburnt till her face is almost mahogany colored, showing outdoor life Eyelids and mucous membrane of mouth show only slight apparent anæmia Patient is thin, but not cachectic Heart and lungs are normal, pulse 88, temperature normal The abdomen is considerably distended in the lower portion by a mass which is neither soft nor hard, feels firm but gives beneath the fingers with the resilience of rubber This mass extends to the umbilicus above, is easily palpated, and fits tightly into the pelvis below There is no fluctuation, and the surface is smooth and even, except on the right side, about McBurney's point, where there is a nodule about the size of a large pear, which is smooth and slightly movable There is no other nodule to be felt at any point

The vagina is pushed up hard against the pubes so that the examining finger passes beneath the pubic bone with difficulty There is a large resilient mass post vaginam The whole pelvis is choke full—so much so that the tumor mass cannot be defined except at the ostium vaginæ and backward toward the rectum, which seems to be the lower border of the mass The cervix is



felt with difficulty only high up and to the right well above the pubic bone. There is no traceable connection between the cervix and the nodule on the tumor above. The cervix has a deep laceration on left side but is otherwise smooth and very little enlarged. Though the mass in the pelvis is apparently continuous with the tumor above this cannot be certainly determined since the whole mass is firmly fixed.

The patient was kept under observation for three or four days before operation during which time the pulse ran between 86 and 100 but the temperature remained normal.

Diagnosis—A probable diagnosis of uterine fibroid was made because the whole mass lay in the median line of the abdomen and not more to one side than to the other except the nodule which lay well against the right abdominal wall making a protrusion of the wall that was easily noticeable to the eye. The resiliency of the tumor suggested a cyst and its relation to the vagina could only be explained as interligamentous. The nodule to the right which was firmer than the rest of the tumor was unquestionably a portion of the tumor since its base was easily felt. Further the mass in the pelvis was more readily explained as a large myomatous nodule than otherwise and it was difficult to explain how the nodule above could be that of a cyst.

For these reasons the diagnosis of fibroid of the uterus as above stated was made.

Operation May 7 1906—The abdomen was opened and the nodule to the right proved to be the uterus only very slightly enlarged perfectly normal in appearance and feel (Fig 1). The right tube and ovary were normal.

The left tube wound over the top of the tumor backward and to the left and was so changed in appearance as not to be recognized except from its position (Fig 1). The ovary was all destroyed except a small portion about the size of a hulled almond imbedded in the capsule of the tumor lying just below a small peritoneal cyst.

The uterus was not pedunculated but sessile in its relation to the tumor and had the appearance of being imbedded in the tumor only about three fourths of the corpus fundus and right cornu projected from the tumor.

The tumor itself was almost immediately seen to be inter

ligamentous This was quickly proven by splitting the ligamentous capsule and enucleating a considerable area of the tumor The resilience was so great and the feel so much like that of a thick walled cyst, and the probability of a cyst over any other form of interligamentous tumor so great that, without hesitancy (after carefully packing away the intestines with gauze pads) a knife was plunged into the tumor preparatory to inserting a trocar to draw off the fluid There was a spurt of blood in a stream the size of my finger, clear over my head, showing the great pressure within the tumor Immediate firm pressure with thumb over the stab controlled the blood sufficiently till the wound in the tumor could be closed with cat gut The blood was bright red and the spurt like that of a large, severed artery

Now that the nature (solid) of the tumor was determined, the ovarian vessels on the left were clamped, cut, and the capsule divided before and behind from this point to the junction of cervix and body of uterus The next step was to clamp the right broad ligament and divide it between clamps down to the uterine artery which was easily exposed and ligated This was done because the uterus was pushed up so high that it was very accessible An incision through the peritoneum in front of cervix was then made, joining the uterine end of the incision made through the capsule of the tumor A similar incision was made behind and the peritoneum pushed down In front of the cervix the bladder was freed and pushed down with the peritoneum The cervix, being small, was then clamped and severed The tumor was then rapidly and easily enucleated by the fingers till it was all free, except where the uterine vessels entered the tumor to the left of the cervix This attachment was quite large on account of the size of the enormously enlarged vessels The tumor was then gently lifted up, exposing these vessels and the left ureter The ureter was isolated and the vessels clamped *en masse* and the tumor cut away All vessels were then secured with cat gut A free incision into the vagina was made and the space left by removal of the tumor was drained by strips of gauze with the ends passed into the vagina The layers of the broad ligament and peritoneum were closed over the gauze packing The abdomen was then closed, completing the operation

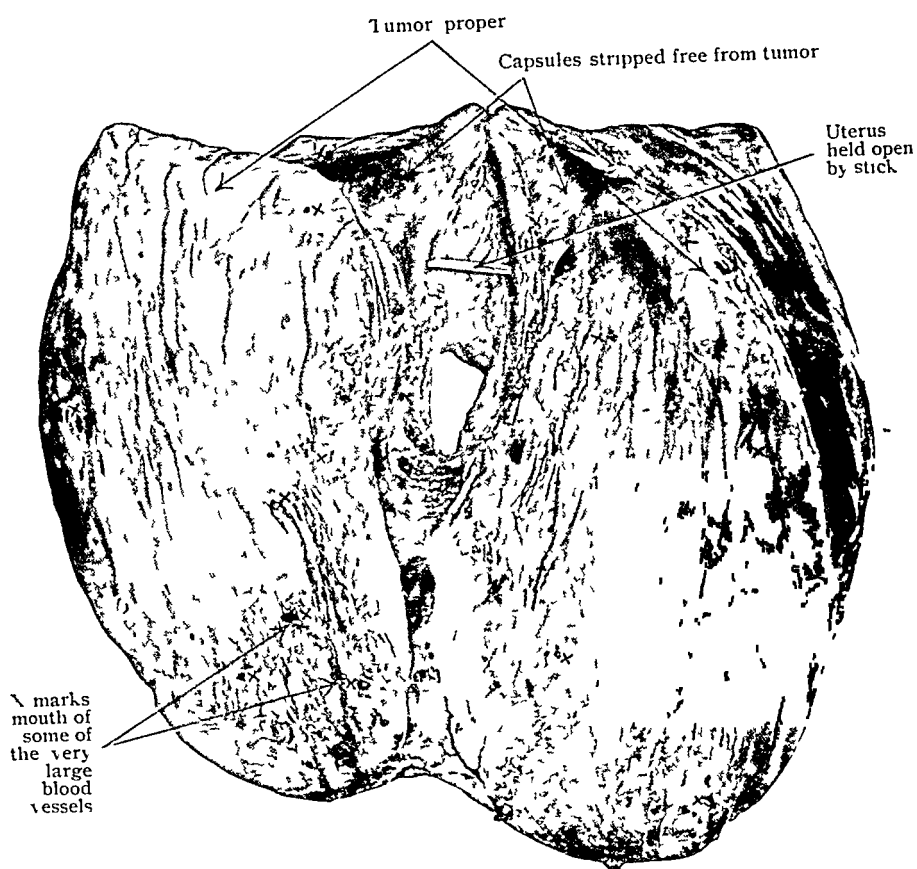
The tumor was when freshly removed, 12½ inches long, 8 inches wide, and 5 inches thick in greatest dimensions The tumor

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FIG 3



Tumor divided through center Note myriads of blood vessel mouths

was so vascular as to closely simulate an angioma. The weight of the tumor and uterus was 12½ pounds. The uterus I am sure would not weigh over half a pound.

The tumor was photographed a few hours later just as it was removed. It was then divided in its long axis from the left margin through the center of the tumor into the left cornu of the uterus down into the body and cervix then spread open and photographed (figure No. 3). The tumor proved to be a myofibroma which did not touch the uterus at any point (see figure No. 3) but was entirely independent of a normal uterus and wholly within the folds of the broad ligament.

The tissue was tough to cut but so full of blood vessels as to be soft and spongy to feel even after all blood was out of its substance.

The patient made an easy but slow recovery on account of long continued drainage per vaginam. The wound healed *primo intentio* and the patient was strong enough to make alone a long railway trip home at the end of six weeks.

The patient's husband tells me that now fifteen months after the operation she weighs 145 pounds and is in excellent health.

Including the author's case there are only twelve American cases reported the first of which was by Burnham in 1867. During the past eleven years beside the author's case there are four reported cases which are briefly as follows:

CASE I HARPEL.—Patient 40 years old married 17 years no children. Up to seven years ago menstruation was normal and health good. Then menstruation was profuse and enlargement in left pelvic region size of an orange. Two years ago some pain felt in that region and another attack a year later. A large firm mass was found to the left and also several smaller myomata in the walls of the uterus. The tumor increased more rapidly from that time and she suffered more than previously from a sense of weight in the left region nervous reflexes and at times distension of abdomen with gas. Menstruation profuse and then ceased altogether.

Operation.—The myoma and left tube were enclosed in a capsule in which were a number of cysts. A complete hysterectomy was done leaving only the cervix. The total mass removed weighed 4¾ pounds after the contents of the cyst had escaped. The capsule which enclosed the tube and the growth weighed 4½ ounces. The left ovary could not be made out and undoubtedly because entirely cystic and adherent in this capsule. The myoma was situated in the left broad ligament, oval

in shape, $6\frac{1}{2} \times 5$ inches, and weight $3\frac{5}{8}$ pounds. It has a distinct capsule, grayish white in color, firm in texture, with a small area of mucoid degeneration in the center. There are three small cystic cavities deep in the mass and blood vessels on or near the surface. The uterus contained five small myomata in its walls.

CASE II, SHAW².—Miss L., aged 26, first noticed (tumor) enlargement of abdomen about 18 months ago, pain in region of right kidney, profuse and long continued hemorrhage. There was found a tumor somewhat irregular in shape, extending more to the right side than to the left, and upwards to within two inches of the ensiform cartilage. The entire pelvis was filled with the mass and the cervix could not be found. There were well marked pressure symptoms—irritable bladder, constipation, pressure in the rectum, and pain extending down the thighs.

On operation the mass was found to be firmly adherent to the bowels and bladder and involved the right broad ligament. The bladder was drawn over to the left and had a depth of nearly 10 inches. Attempts were made to separate the tumor from the bowels and bladder, but it was impossible to deliver it through the abdominal incision. The uterus, pushed upwards and to the left, seemed healthy, as were also the left ovary and tube. The broad ligament was clamped, ligated in sections close to the uterus and cut. The tumor was then removed as completely as possible with the scissors.

The tumor contained a dark, sanious fluid, the walls being of great thickness. It proved to be a fibroid on microscopical examination.

CASE III, BOVÉE³.—Tumor removed from a spinster of 37 years, who first noticed the growth six years before. She was anæmic from loss of blood and very nervous. The growth was somewhat fixed and extended from low down in the pelvis to the umbilicus. When the abdomen was opened, the mass was found to have developed in the right broad ligament, and was the largest of this variety he had seen. It was removed by Pryor's method of cutting down on one side of uterus and appendage, through the uterine body, clamping vessels as they appeared, and up on the other side. The ureter was first traced downward along the inner side of the growth and was avoided by the sense of sight during the removal of the growth. This operation is the best he knows for large, broad ligament fibroids, and if the location of the ureter is first ascertained, no danger of injuring it will likely occur during the operation.

CASE IV, GOLDSPOHN⁴.—Aet 50, one child 30 years before. The condition within the vagina was very much that of a woman eight months advanced in pregnancy, with a very short, soft, stubby cervix presenting at the middle of the vaginal inlet, and the upper part of the cervix expanded. It appeared to be a uterus with one or more fibroids posteriorly, and also a cystic ovarian tumor in front of it. In making an incision about 4 inches in length, there was beneath the entire length of the incision something that looked very much like an ovarian cyst, very much engorged with veins, and different from a cyst, however, in its consistence, in not being membranous, but thin-walled, of rather doughy, edematous structure. Examining for its attachment, it was evident that

this mass was extraperitoneal and it was soon demonstrated that it was the bladder by simply squeezing upon it urine was extruded (several ounces) which could not be obtained by the catheter which was passed immediately before making the incision. This patient had had retention of urine some three months ago and at that time required to be catheterized for a week or more and recently before coming to the hospital she was troubled in the same way for nearly two weeks and she came with a very pronounced cystitis of old standing which had infiltrated the bladder walls to that extent. The tumor was found to be a lobulated fibroid two pieces separated completely from each other the tumor having developed entirely within the right broad ligament. The uterus was not enlarged as it usually is with a fibroid of this size because the fibroid lay entirely outside of its walls and therefore she did not have the usual menorrhagia and metrorrhagia—a feature which cast some doubt upon the presence of a fibroid in the diagnosis. In removing the tumor he first ligated the ovarian arteries which were accessible the bladder was then detached from the tumor anteriorly. But with the tumor in the broad ligament the uterine arteries were wholly inaccessible. He therefore simply incised the capsule of the tumor and enucleated that first. This allowed the whole mass in the region of the cervix to rise higher in the pelvis and made it comparatively easy to ligate the uterine arteries and to do a suprapubic vaginal amputation.

Pedicated interligamentous tumors are anatomically speaking entirely independent of the uterus and are very rare only nine cases appearing in the literature which are briefly as follows:

CASE I MIKULICZ —Null para 22 never menstruated fibromyoma 5 kg in weight extensive adhesions to omentum and transverse colon pedicle having the right ovary attached was united with the right broad ligament. Tumor tissue highly edematous.

CASE II SANGER —Crl 19 double tumor weight 8510 grm attached left broad ligament by a short narrow pedicle. Anatomical diagnosis cystic fibromyoma. Left ovary was the seat of small follicular cysts but had no connection with the growth.

CASE III BILFINGER —Autopsy case fibromyoma right ligament pedicle springing from upper surface and hung from it like an apple. No connection with uterus and ovaries which were completely normal.

CASE IV DORAN —Removed a ligamentous fibromyoma weighing over 16 pounds from a woman of 32 years. Close examination shows the ovary and tube beneath the pedicle so that the tumor must have originated in the ovarian ligament.

CASE V GROSS —Null para 31 years fibromyoma having thick pedicle removed from posterior upper portion of right ligament. Ovaries and tubes normal as well as the uterus. Tumor egg shaped, 2500 gm.

CASE VI DOLÉRIS —Fibromyoma of broad ligament, having pedicle

56 cm in length Tumor was globular in form and contained numerous larger and smaller cysts

CASE VII, *Arch de Tocol et de Gynec*—Case reported of an hysterical person of 23 years Removal of oval fibromyoma 9 x 6 cm from upper border of right ligament, with pedicle two fingers breadth from uterus All genital organs normal

CASE VIII, L TAIT¹¹—Woman, 55 years Tumor extirpated weighed over 2 pounds, attached by a broad, edematous pedicle to broad ligament, close to, but distinctly separate from the left margin of the uterus On section, a considerable amount of fluid drained away The edema spaces were smaller and more numerous, and there was less tendency to the formation of distinct cysts than in the uterine edematous myomata

CASE IX, DELETREZ¹²—Woman, 42 years, single, for three months noticed enlargement of the abdomen and pain in right thigh Palpation showed a hard, mobile tumor situated in the median line, below the umbilicus On laparotomy a fibroid growth, weighing 2500 grms, "size of fist," was removed from right broad ligament, having a pedicle originating near the right side of uterus, which latter was normal, right ovary atrophied, left ovary contained multilocular cyst and was extirpated

In looking over these nine cases of pediculated fibromyoma, a striking feature presents itself in that most of them were situated in upper portion of the ligamenta lata, *i e*, the ala vesperilionis Sessile interligamentous tumors differentiate themselves clearly from the pedicled variety by having their seat usually in the middle portion of the ligament, which portion is richest in muscle supply and nearest to the uterus This site of predilection explains the view taken by many authors in the uterine development of this form of tumor At this site fibromyomata find the best soil for growth, not only by the abundant layers of muscle fiber tissue, but also the uterine artery, with its branches, furnishes copious material for nourishment

Delétréz says the origin of these tumors has been long contested Most pathologists consider them as neoplasms emigrating from the uterus to the ligament, others believe they originate in a fragment of ovarian tissue, or from an accessory ovary occurring by an anomaly

The author has studied as the foundation of this paper twenty-six cases of primary fibromyomata of the broad ligament, sixteen of which have occurred in the past five years and are not included in the series collected by Sanger, Doran, Senn, and Sutton, elsewhere alluded to

ETIOLOGY —European literature is much richer in the e tumors than American there appearing eight cases in the French literature alone during the past five years Several occur in German and a few in English literature during the same period

Sanger ¹³ was the first to demonstrate that these tumor of the broad ligaments form a group to themselves basing his conclusions on clinical and anatomical grounds while Virchow ¹⁴ was the first to describe clearly and definitely the occurrence of fibromyomata at this site He himself found a fibroma the size of a bean of characteristic structure in the ala vesperitilonis immediately above the ovarian ligament and far away from the uterus and fallopian tube thus showing definitely the ligamentous origin of the growth

Numerous authorities are cited by Krekels ¹⁵ to show the independent origin of these growths That fibromyomata are found within the broad ligament as well as in the uterus is natural since the same smooth muscle fibres and connection tissue are found here as in the uterus

ORIGIN —According to Burkard ¹⁶ the most frequent site of origin of fibromyomata of the broad ligament is in that portion nearest the uterus since there exists at this location the greatest abundance of muscle tissue More rarely they spring from the ala vesperitilonis in which event they are pedicled whereas the former are sessile Fibromyomata of the peripheral portion of the broad ligament i.e. the infundibulo-pelvic ligaments where muscle tissue is very scant are very rare Burkard ¹⁶ reports such a case in which the tumor the size of two fists was accompanied by a hypernephroma of the same side of 30 years standing while the fibroma was of 15 years growth This growth is looked upon as a curiosity and Burkard thinks it possible that the hypernephroma had some genetic influence upon its development

AGE —The most frequent occurrence is between the ages of 30 and 50 years Doran ¹⁷ in analyzing 39 collected cases found 6 below 30 years and the same number above 50 years of age In the series of 16 cases collected by the writer the

extremes of age are 22 and 56, of which three occur before 30 and two after 50 years. It is evident from studying this subject that the age of development corresponds in every respect to that of uterine fibroids which was to be expected.

PATHOLOGY—Fibromyomata occasionally obtain an enormous size, thus Doran¹⁷ reports his case in which the tumor weighed 44½ pounds. In 24 others he gives the weights as follows: Two between 30 and 40 pounds, two between 20 and 30 pounds, ten between 10 and 20 pounds, eight between 1 and 10 pounds, and two below 1 pound. In my own series, collected from the literature of the past five years, the tumors are generally small, as is to be expected since operative treatment is so much more readily and quickly submitted to now than formerly. My own case of 12½ pounds seems to be about the largest of the American cases.

GROWTH—Growth is generally slow, though it may occasionally be very rapid. As an example of the former, Chardon¹⁸ reports his case as having been observed for twenty years before removal, at which time it was still a comparatively small tumor, measuring 15 x 25 cm. Pollosson¹⁹ also reports his case as having been under observation for 15 years prior to operation, and numerous other authors comment upon the slowness of growth. On the other hand, as an example of rapid growth, Duroux²⁰ reports his case of a large fibromyoma of the ligament which grew so rapidly as to have a clinical history of only 11 months. So rapid was the growth that Duroux was led to make the diagnosis of ovarian cyst.

From studying not only my own series but those of others, collected prior to this, it is evident that in point of growth, as well as in other respects, broad ligament fibromyomata closely resemble those of the uterus in that they, as a rule, grow slowly, especially until after they have obtained considerable size, when at some inexplicable point, sometimes due to adhesions formed, growth becomes rapid. The soft, myomatous form, as in the uterus, grow more rapidly than the denser, more fibrous tumors. The author's case, a typical soft myoma, is a good example of growth in this kind of tumor in which

case growth was very rapid for three or four months prior to removal

MORPHOLOGY —The small growths are nearly always mononodular and more or less ovoid in form while the large ones are frequently lobulated rather than nodular. This lobulation is noted frequently by reporters notably Doran and Pollosson.

The growths are surprisingly constant in being unilateral though bilateral tumors do occur as is evidenced by the case reported by Thiery ¹ in which two fibroids—one on either side of uterus—were removed. It is interesting to note that in this case the uterus was enlarged (twice normal size) though the tumors had no connection to uterus and the patient suffered from metrorrhagia which is very unusual. I find only this one case in which the growth was bilateral whereas we would expect the condition commonly.

Histologically fibromyomata of the broad ligament correspond exactly to uterine fibromyomata the growth consisting of smooth muscle fibres and connective tissues irregularly distributed. Macroscopically therefore the cut surface is firmer whiter and more glistening in proportion to the predominance of connective tissue or redder softer and duller when the muscular element exceeds.

These tumors usually have much less fibrous tissue than the corresponding uterine tumors consequently they are softer often having a peculiar resiliency not unlike rubber. This is frequently noted by authors as for instance Krekels reports Sanger as having a case in which the tumor was so resilient as to stretch like rubber and in the author's case the resiliency was strikingly noticeable.

Edema of the tumor tissue is by far the most frequent metamorphosis it having been found present in many cases reported. A very peculiar pathologic condition may arise from a transudation of the fluid within these edematous fibromyomata into the surrounding loose connective tissues and from there into the natural channels leading to the openings of the vulva perineum or inguinal canal and thus produce a condi-

tion simulating hernia Stern ²² describes three such cases as happening in Von Langenbeck's clinic and five such cases were observed by Schroder In one case a portion of the tumor appeared at the right vaginal wall into the introitus vaginæ

Nerow ²³ published an interesting case in which the patient, aged 44, came to treatment for complete rupture of the perineum and prolapse associated with two small fibromyomata to the right and left of median line, causing bulging of the vaginal wall, which were removed per vaginam, and found located in the connective tissue between the cervix, lateral pelvic wall, and bladder

DEGENERATIONS—Cystic degeneration is quite common in fibromyomata of the broad ligaments, the cystic accumulation of fluid being found in large quantities in a few cases notably so in the cases reported by M Chardon ¹⁸ and Tédénat ²⁴ In the former, there were 12 litres of transparent, yellowish sero fibrinous fluid, and in the latter 8 litres Usually, however, the fluid is dark in color and small in quantity Kelly ²⁵ reports a case in which the cyst contents was pus

Demons ²⁶ and Wathen ²⁷ each report a case of calcareous degeneration, while Harpel's ¹ specimen showed mucoid degeneration Fatty degeneration is also noted by Konrad, ²⁸ in a soft myoma of left broad ligament, weighing 20 pounds Mikulicz ²⁹ reported a case in which the tumor, the "size of a man's head," of the right broad ligament, had no connection with uterus or ovaries, although on the ovarian side the tumor contained a small, dermoid cyst

These tumors seem to be always benign, in no instance have I been able to find a case reported of malignant degeneration

DIAGNOSIS AND TREATMENT—The diagnosis of fibromyomata of the broad ligament is more or less difficult even when small, and when large the diagnosis is practically impossible till the abdomen is opened The symptoms are so uncertain and so variable that little assistance is given from this source There are a few symptoms, however, which are suf-

ficiently constant to be well worth noting. The unaffected condition of the menstrual function is the most constant symptom this being remarked upon by almost every author of reported cases in which the uterus was normal. In the author's case the disturbance of menstruation was almost certainly due to approaching menopause. When the uterus is also fibroid there is metrorrhagia just as in a fibroid uterus uncomplicated by broad ligament fibroids. Pain occurs only from pressure and crowding of tumor or incidental inflammations of the tumor or neighboring organs which bring about adhesions. Slow growth is the third symptom of importance and has already been discussed.

Doran says the patients are usually thin and anæmic although flooding does not occur.

The diagnosis where made is nearly always arrived at by the physical examination which when the tumor is small may not be difficult.

The treatment is complete removal by operation the prognosis of which is most excellent there not being a single death reported from this operation for many years.

Monod³⁰ refers to 200 cases collected by Strokeker in 1902 in which the mortality was 22.2 per cent (77 cases 17 deaths) by simple removal while it was only 12.2 per cent (57 cases 7 deaths) when removal was accompanied by hysterectomy. Most of these deaths occurred prior to 1890.

Doran in his series of 39 cases reports 6 deaths in 12 cases of simple enucleation of tumor all occurring before 1890.

OPERATION—In the great majority of cases it is necessary to remove the uterus along with the tumor because hemorrhage is so much more easily controlled and further if the tumor is removed alone the uterus is left without support on that side which is liable to be followed by all kinds of malpositions and adhesions which will prevent the perfect recovery of patient. Castaing and Philippe³¹ report such a case. After the simple removal of a 7 pound fibromyoma from left broad ligament it was found necessary later to remove uterus and adnexa at a second operation.

The operation itself is, as a rule, easy, the most troublesome feature being the avoidance of the ureters. In most cases this is easy by simple enucleation of tumor by the fingers, after capsule is opened on a line between the point of ligation of the ovarian vessels, at the pelvic wall and the uterine cornu. The ureters are nearly always displaced by the growth and in cases of dense adhesions their avoidance may be very difficult, as is shown by the case reported by Thiery,²¹ in which the fibromata were bilateral and exceedingly difficult to remove on account of ureters which had to be dissected away from tumors on both sides for about 15 cm. Urinary fistula through abdominal wall followed, which closed on fifteenth day after operation. Recovery.

This operation may be made difficult by adhesions to omentum, intestines, or other organs, especially noticeable is Billroth's case reported by Buschmann,³² in which an 18 kg fibromyoma of left broad ligament was so densely adherent to the left kidney and adnephrium that complete removal of those organs with the tumor was necessary, as every effort to separate them was futile on account of hemorrhage. Adhesions to bladder and abdominal wall are noted as making the operation very difficult in the case reported by Rydyggier,³³ but, as a whole, these tumors are remarkably free from adhesions, which is natural since their site of origin is not connected with any external source of contamination, as are the ovaries and uterus.

Although numerous authors have described the technic of the operation, which is essentially the same by all operators, with modification to suit the individual case, it does not seem profitable to discuss these various modifications of operative procedure, since, in recent years, all methods seem to have been equally successful.

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THE RENAL CATHETER AS AN AID IN THE DIAGNOSIS OF VALVE-LIKE OBSTRUC- TION OF THE URETER.

BY JOHN A SAMPSON, M D,

OF ALBANY, N Y,

Gynecologist to the Albany Hospital, Clinical Professor of Gynecology in the
Albany Medical College

It is not the purpose of this communication to review the many ways the renal catheter may be employed as a means of diagnosis in diseased conditions of the kidney and ureter, but to report two cases of valve-like obstruction of the ureter, and demonstrate how it was used in these two cases

Dr H A Kelly has not only contributed greatly to the development and perfection of cystoscopy and the catheterization of the ureters in women, but he has also described two especially valuable methods of diagnosis, made possible by the use of the renal catheter The first of these is the use of the wax tipped catheter as a means of detecting ureteral and renal calculi This was first published by him¹ in 1895 and in a later communication² he reported twenty-four instances in which the presence of a calculus had been determined from the scratch marks on a wax tipped catheter By this method calculi have been detected when the X-ray picture has failed to show any shadows suggesting them, and shadows have been present in an X-ray picture, suggesting calculi in the lower end of the ureter, which, after the failure to detect their presence by means of the wax tipped catheter were shown to have arisen from phleboliths in the veins of the broad ligament The wax-tipped catheter, as a means of detecting urinary calculi, cannot entirely take the place of the X-ray, for a calculus in a renal calyx or a small one in the pelvis of the kidney may easily fail to come in contact with the wax on the catheter and so escape detection Other sources of failure in detecting calculi by this method have been fully described by Dr Kelly³ The X-ray

picture when positive also gives more exact information such as the size number and situation of the calculi which cannot be determined by the other method. On the other hand even at the present time when the technique of radiography is so efficient the wax tipped catheter gives most valuable information and often enables one to confirm or disprove the results of the X ray.

The second diagnostic method devised by Dr Kelly is of even greater value and is capable of a wider application than the former. This method is the use of the renal catheter as an aid in determining the seat of obscure pain in the side by producing artificial renal colic through forced injection of the renal pelvis. The patient is able to state whether or not the symptoms arising from the distension of the pelvis of the kidney by means of sterile fluid forced through a renal catheter are similar to or different both in character and location from those from which she suffers. This method was presented to the American Gynecological Society in May 1899. At that time six cases had been investigated by this means and were reported⁴ in full. Later H. T. Hutchins reported⁵ one hundred cases from the records of Dr Kelly's private sanitarium and the Gynecological Clinic of the Johns Hopkins Hospital which had been studied in this manner. Hutchins' communication is of especially great value as he has carefully studied and described the character and location of the pain arising from the injection of the pelvis of normal kidneys under various degrees and rates of distension.

In the two cases about to be reported I wish to demonstrate a further development of the two methods of diagnosis just mentioned.

CASE I.—Mrs S. M. aged 57 Johns Hopkins Hospital Gyn. No. 10860.

Diagnosis—Stricture of the intra mural portion of the left ureter with a secondary valve like obstruction at the pelvic brim.

Treatment—Resection and re implantation of the ureter into the bladder release of the kink at the pelvic brim both by the extra peritoneal inguinal route through a gridiron incision.

History of Case—The patient complained of severe attacks of pain in the left side and back. She was transferred from the Medical to the Gynecological Clinic of the Johns Hopkins Hospital on November 9, 1903. (At that time I was resident gynecologist at that Hospital.) Past history was of little value, married, six children, oldest thirty-six and youngest twenty-six years of age. There was no record of any illness until the present one.

Present illness began in May 1902 with attacks of severe pain in the region of the left kidney. At first the pain did not radiate and there were not any urinary symptoms. These attacks had been increasing in severity and in frequency, and in the later ones the pain had radiated from the region of the left kidney down towards the bladder. She was unable to void during or just after one of these attacks. There had never been any blood in the urine nor had she passed any calculi, although her attacks had been diagnosed as renal colic. The patient was studied in the ward and had two of these attacks in five days. These seemed to be very severe and were controlled by large doses of morphia. The examination of the urine showed it to be normal.

The patient's general condition was apparently excellent. She was very large and the physical examination was unsatisfactory. While no mass was felt in the region of the left kidney (abdominal walls were very thick) there was tenderness in this region and along the course of the left ureter.

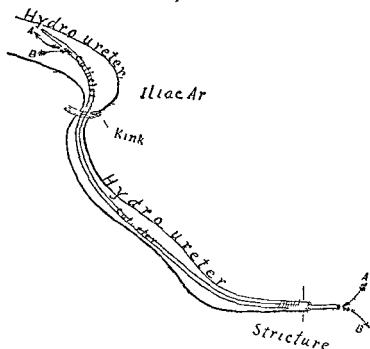
November 16, 1903, I made a cystoscopic examination, patient in the knee-chest posture. The bladder, including both ureteral orifices, appeared to be normal. Repeated attempts to catheterize the left ureteral orifice failed. There seemed to be a stricture of the intra-mural portion of the ureter. A few hours after this examination, the patient suffered from the most severe attack of pain she had ever had and it was necessary to anesthetize her with chloroform in order to relieve her. The attack did not cause any elevation in temperature or increase in pulse rate.

Observations which should have led to the diagnosis of ureteral stricture and secondary "kink," with valve-like obstruction, November 18, 1903.

As a result of the previous examination it seemed evident that there must be a stricture of the intra-mural portion of the

ureter and the question arose as to its cause. A small ureteral catheter with a filiform point was chosen. The wax used for tipping the catheter for the diagnosis of urinary calculi was melted and by means of sterile forceps four drops of the melted wax were applied to the catheter at intervals. The entire catheter was warmed by passing it through the flame of an alcohol lamp

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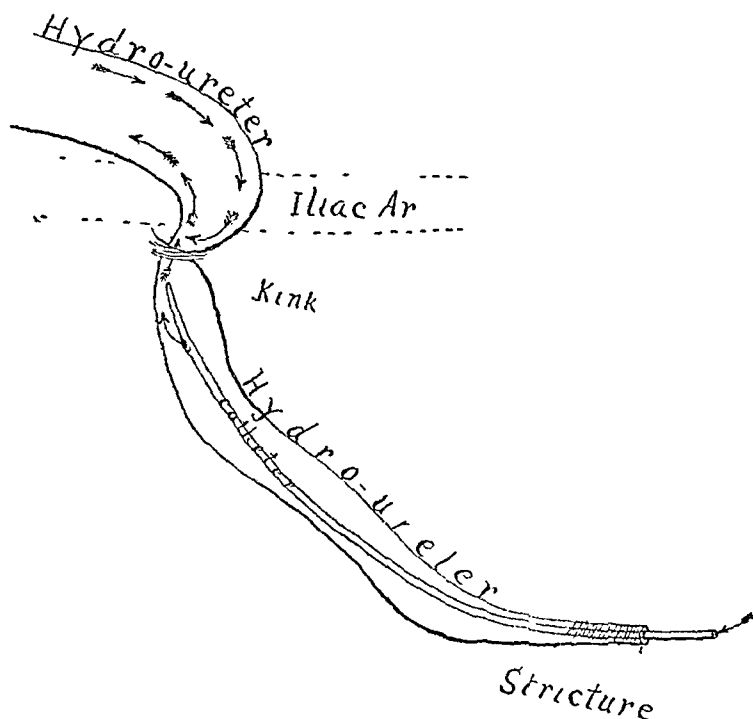


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and at the same time the drops of wax attached to it were melted and then by tipping the catheter up and down the melted wax flowed over the entire catheter and coated it with a fine coat of wax which increased but very little its diameter. This represents but a further development of the wax tipped catheter of Dr

Kelly and one which I have used for the detection and localization of calculi in the ureter. The catheter easily passes the calculus and the wax coating is scratched for the distance it extends beyond the calculus. By taking measurements one is able to estimate the situation of the calculus. A calculus so detected and located by the author has been reported⁶

FIG 2



Further observations in Case I, which should have led to the correct diagnosis, $\approx \frac{2}{3}$

On slowly withdrawing the catheter (shown in Fig 1) the return flow suddenly ceased when the eye of the catheter had apparently been drawn past the "kink," see Fig 2. Artificial colic was induced with the catheter in its present position, but only a small amount of the fluid was returned (that from the pelvic portion of the ureter). The large amount which had extended beyond was prevented from returning by the "kink," which acted as a valve and the greater the distension above, the more efficient the valve. The condition was relieved by pushing the catheter further up the ureter when the fluid gushed from the end of the catheter, thus indicating that the eye of the catheter was then situated above the "kink."

Through a Kelly cystoscope, the patient in the knee-chest posture, the wax coated catheter was inserted into the left ureteral orifice and with considerable difficulty it was passed up the ureter for a distance of about 10 cm when it apparently encountered another obstacle. After a little more manipulation this was passed and urine escaped freely from the catheter. This

caused me to think that there were two strictures present instead of one. The patient now assumed the Sims posture (more comfortable) and artificial hydronephrosis was induced by injecting sterile fluid through the catheter as described by Dr Kelly. This procedure caused an attack of pain which was similar in every way to those from which the patient suffered. On permitting the fluid to escape from the catheter the patient was instantly relieved (see Fig 1). The catheter was then partially withdrawn (Fig 2) and on again injecting fluid into the ureter an attack similar to the first one was produced but on permitting the fluid to escape only a very small amount came away (probably only that in the pelvic portion of the ureter) and the patient was not relieved. After waiting in vain a few minutes for the escape of the fluid the catheter was withdrawn. As the patient was still in pain the ureter was catheterized again and after passing the same distance into the ureter as before fluid gushed from the end of the catheter affording great relief to the patient.

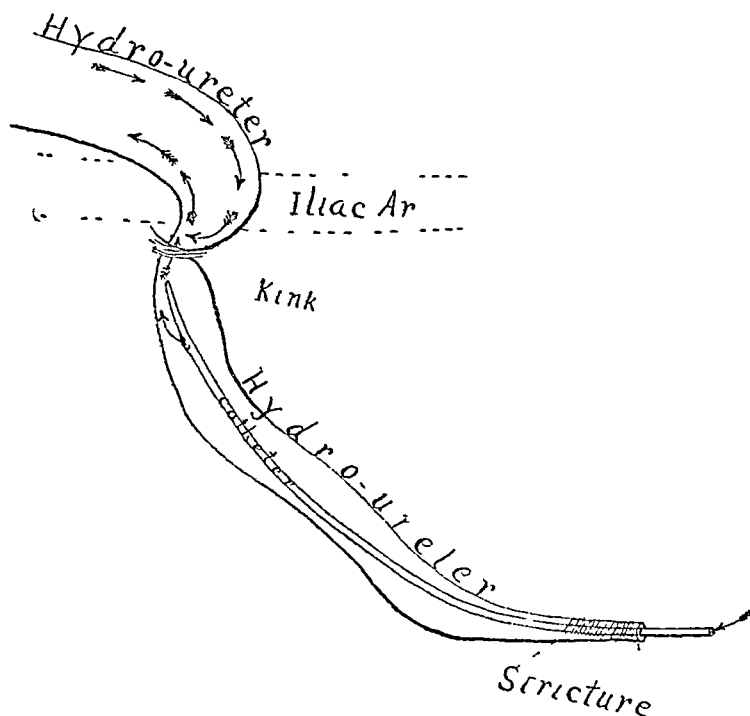
It was evident from this examination that there was a stricture of the intramural portion of the ureter and an obstruction at or near the pelvic brim which permitted fluid to pass it from below upwards but prevented its return. The absence of scratch marks on the wax coated catheter excluded the possibility of either obstruction being due to a calculus.

Operation with description of condition found November 21 1903

Under ether anæsthesia an incision was made through the skin parallel to the left Poupart's ligament and the fascia and muscle of the abdominal wall were separated forming a so called gridiron incision (as in the well known McBurney incision) down to the peritoneum. The latter was now pushed back from the abdominal wall and the side of the pelvis. The uterine artery was ligated and cut and the left ureter was exposed from above the pelvic brim to its entrance into the bladder. It was dilated and especially the portion above the pelvic brim where its diameter was nearly 1.5 cm. The ureter was very tortuous and just beneath the pelvic brim a distinct kink was present which was caused by connective tissue crossing the ureter and above this kink occurred the greatest distension of the ureter. The condition present seemed to have arisen as follows. The ureter

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through its peristalsis tends to form a sheath from the tissue about it. This sheath varies with the tissue along its course and cannot be considered as a distinct structure belonging to the ureter. It is more marked in some individuals than in others and is usually better formed about the pelvic than the abdominal portion of the ureter. For these reasons the sheath can sometimes be definitely demonstrated in cross section and in other instances not. This sheath is of very little importance but occasionally plays an important rôle in pathological conditions, as has been previously emphasized⁷ by the writer. In this patient a stricture (cause not determined) was present in the intra-mural portion of the ureter. The obstruction to the outflow of urine gave rise to distension and an increased tortuosity of that duct. A kink apparently arose from a tortuous part of the ureter breaking through a weak portion of its sheath, *i e*, a hernia, and the lower portion of the hernial ring was formed by the stronger structures of the sheath which did not give way but held the ureter in place at that spot. The kink occurred at the lower end of the abdominal spindle, *i e*, at the situation of a natural constriction of the ureter.

The fibres causing the kink were severed, the ureter freed and immediately the kink disappeared. A small incision was made in the upper part of the pelvic portion of the ureter and a medium sized renal catheter was passed towards the bladder but could not be made to enter that organ. The ureter was cut off just above the bladder, and after excising enough of it so as to reduce its tortuosity, it was re-implanted into the bladder in the following manner. A pair of long artery clamps was introduced through the urethra, pushed against the bladder wall just above the original insertion of the ureter and the bladder was incised at this place. The forceps were then pushed through and made to grasp the end of the ureter which had been split for a distance of 5 cm. This was then drawn into the bladder for a distance of about 2 cm and held in place while the bladder wall was sutured to that of the ureter with fine silk, taking care not to compress the latter. A renal catheter was now passed into the bladder through the opening made in the ureter and drawn through the urethra. The opening in the ureter was closed with one silk suture and the field of operation drained with iodoform gauze.

Post Operative Course—A urinary sinus developed through the inguinal incision apparently from the opening in the ureter. The patient left the hospital on December 23rd with a slight urinary discharge which was not constant. This discharge ceased entirely in the early part of January 1904 and the patient felt completely relieved. At about that time (date not present in the records) a cystoscopic examination was made and the end of the ureter could be seen projecting from the bladder wall for a distance of about 1.5 cm. Attempts to catheterize this failed and fearing that so long a portion of the ureter projecting into the bladder might act as a foreign body and cause trouble about half of it was amputated by means of a nasal wire snare introduced through a Kelly cystoscope. On January 28 1904 another cystoscopic examination was made. The ureter now projected about .5 cm into the bladder it could be seen to retract and urine spurted from it as from a normal urethral orifice and a medium sized renal catheter was inserted without difficulty.

In a letter received from the patient in April 1907 over three years after the operation she stated that her general health was excellent she had not had any attacks of renal colic but that she occasionally had some pain low down in the left inguinal region and especially after taking long walks.

CASE II—Miss F. S. aged 20 Gyn No 11001

Diagnosis—Probable valve like obstruction of the upper end of the ureter diagnosed by means of the renal catheter.

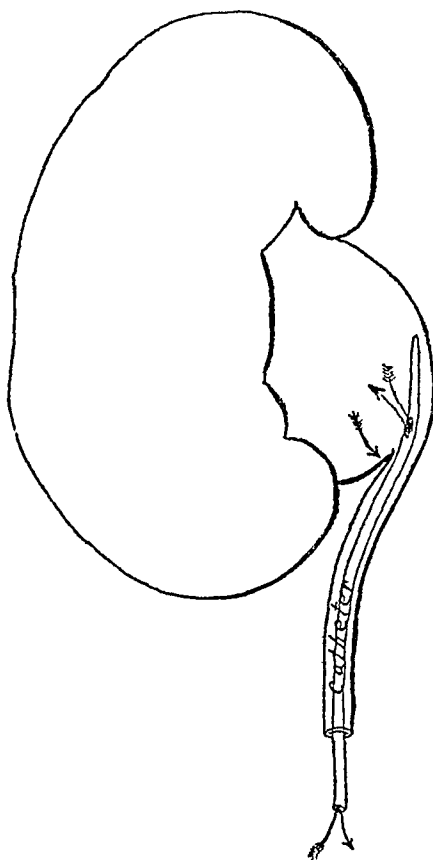
Treatment—Dilatation of the upper end of the ureter by means of graduated bougies (olive and spindle shaped enlargements of wax on renal catheters).

History of the Case—The patient has already been referred to in a publication² by Dr. Kelly showing the value of the wax tipped catheter as a means of detecting renal and ureteral calculi under cases Nos 19 22 27 and 33 of that article. She had been operated upon by him four times three nephrolithotomies twice on the right kidney and once on the left and at the last operation in October 1903 an exploratory nephrotomy of the right kidney was made and also the upper end of the ureter was freed. Nothing was found in the last operation to account for the pain in the right side both X ray and wax tipped catheter were negative for the right kidney but the X ray showed a calculus in the left kidney from which the patient did not have any symptoms.

The patient was re-admitted in January, 1904, and stated that she had had six severe attacks of pain in the right side since she left the hospital the previous November

The following report is from records of observations I made of the case during her last admission and demonstrate some of

FIG 3

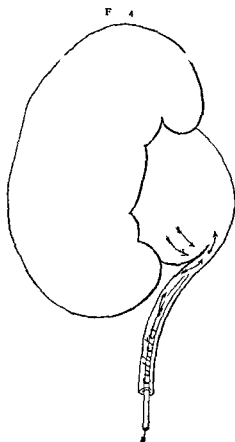


Probable valve like obstruction at the origin of the ureter from the renal pelvis, $\times \frac{2}{3}$

This illustration represents the condition possibly present in the second case. As in the case represented in Fig 1, artificial renal colic could be induced and again relieved by permitting the fluid to return through the catheter, which extended into the pelvis of the kidney

the possibilities in the use of the renal catheter. These observations were not confirmed by operation. It must be remembered that calculi had been removed from the right kidney twice and at the last operation an exploratory nephrotomy had failed to reveal any and the X-ray and wax-tipped catheter were negative

On January 27 1904 patient in the Sims posture (in this case this posture was as serviceable as the knee chest and was easier for the patient) a cystoscopic examination was made and the right ureter was easily catheterized with a large renal catheter. The catheter was passed up into the renal pelvis and artificial renal colic was

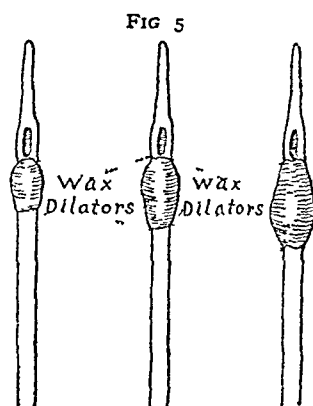


Further investigation of the catheter (see Fig 3) showed that the catheter was not properly placed in the renal pelvis. The catheter was inserted into the renal pelvis and the fluid was allowed to escape from the catheter (see Fig 4). Artificial renal colic was caused by injecting sterile fluid through the catheter. This caused pain similar to that from which she suffered and she was relieved by permitting the fluid to escape from the catheter (see Fig 3). Bearing in mind the first case the pelvis was again

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distended with fluid and then the catheter was slowly withdrawn a short distance when suddenly the fluid ceased to flow and the patient was not relieved. After waiting a few minutes for the fluid to appear, I attempted to re-introduce the catheter into the pelvis of the kidney, failed at first but finally succeeded. It seemed that there must be present a valve-like stricture or kink near or at the renal pelvis which prevented the outflow of urine when the pelvis was distended (see Fig 4)

The patient refused to be operated upon. On the other hand, she consented to attempts to dilate the upper end of the ureter. Dilators were devised by making spindle enlargements of wax on the ends of large renal catheters just below the



Wax dilators on the end of renal catheters, used in dilating the ureteral 'valve' in the second case, natural size

These were made by applying melted wax to each catheter, just below its eye, and then moulding the wax by turning the catheter in the flame of an alcohol lamp. As 'olive tipped bougies' they may be felt to 'hitch' over any narrowing of the ureteral lumen, and by passing them to and fro into the renal pelvis, of the second patient especially when the pelvis was dilated, thus narrowing the valve like obstruction or 'kink' the efficiency of this 'valve' was apparently destroyed. Artificial renal colic could be induced and the patient relieved, even though the end of the catheter was not in the pelvis of the kidney. The patient has not had any attack of pain in the region of the kidney since their use (over three years ago).

eye so as not to obstruct the lumen of the catheter (see Fig 5). These dilators were easily passed up the ureter in this case, even dilators having a diameter of 3-4 mm. The pelvis of the kidney was distended by injecting fluid through the catheter so as to force the valve back against the catheter and then the latter was repeatedly partially withdrawn and pushed back with the hope that the spindle enlargement, which could be felt to "hitch" over the obstruction, would destroy the efficiency of this ob-

struction (valve) This was tried on four different occasions at intervals of two or three days After this treatment I felt encouraged for the valve was apparently no longer efficient as fluid would escape in time from the catheter after the latter was partially withdrawn showing that the fluid could escape (though slowly) from the distended pelvis of the kidney even when the catheter was not in it

The treatment on February 17th was more vigorous than usual as I hoped it to be the last one After the patient returned to the ward she had a severe attack of pain in the right side similar in every way to the previous ones As this pain did not subside I catheterized the kidney and as the catheter entered the pelvis blood with clots flowed from the catheter Two hundred cc of blood was collected and the patient was immediately relieved This apparently demonstrated that the valve was probably still efficient for blood had not appeared in the bladder it having been all retained in the pelvis of the kidney Apparently the attempts to destroy the efficiency of the valve had failed The patient remained in the hospital a month longer and while the wax bougies were again tried greater care was exercised in their use in order to prevent any further injury

In a letter received from the patient in May 1907 (over three years after the treatment with the wax dilators) she stated that her general health was excellent and that she had not had any pain since she left the hospital in March 1904 The efficiency of the valve like obstruction at the orifice of the ureter from the renal pelvis had disappeared and apparently as the result of passing wax dilators to and fro into the pelvis of the kidney at a time when the valve was most efficient viz when the pelvis of the kidney was distended with fluid

Hutchins in the article previously mentioned reports an instance of distension of the pelvis of the kidney without return of the fluid demonstrating a valve like occlusion of the pelvis This observation was made by him in March 1906

RESUMÉ

Ureteral kinks may arise from various sources as an abnormal origin of the ureter from the pelvis of the kidney blood vessels crossing the ureter adhesions etc.

I wish especially to call attention to the part played by the tissue *normally* present about the ureter, in causing these "kinks" As I have previously stated the peristalsis of the ureter tends to convert this tissue into a form of sheath which, as such, may be distinct in one place and less distinct or absent in another Any interference with the outflow of urine from the lower end of the ureter causes a dilatation of the ureter and its course becomes more tortuous This tortuosity is but an exaggeration of its natural course brought about by the dilatation of the ureter and the varying amount of interference with its peristalsis from the tissue along its course This tissue (its sheath) being stronger in some places than in others restricts both the distension and the movements of the ureter at these places while the less resistant tissue, above or below these, permits it to become distended and to curve to either one side or the other This lateral displacement of the ureter is sometimes so marked as to form a sort of hernia of the ureter through the less resistant tissue (a weak place in its sheath) about it The tissue which restricts the movements of the ureter in these cases may so kink the ureter as to give rise to a valve-like obstruction which occludes the lumen of the ureter only when the portion above the kink becomes greatly distended This distension of the ureter may be caused by anything interfering with its outflow

It is important, therefore, when operating for ureteral obstruction to carefully examine the ureter above, in order to relieve any kinks which may have developed as a result of the obstruction and which otherwise might not be entirely relieved by the operation There is a natural constriction of the ureter at the pelvic brim due to the tissues about it, and also to its change in direction, as it dips into the pelvis There is at this place, therefore, a condition present which predisposes to the location of a kink, as occurred in the first case reported

Valve-like ureteral kinks from any source or of any location may be detected by the renal catheter in the following manner If the end of the catheter is passed beyond the kink and sterile fluid is injected through the catheter, distending

the ureter and renal pelvis above the patient will complain of pain (artificial renal colic) and on removing the rubber bulb or syringe from the end of the catheter but leaving the catheter in place the fluid injected into the pelvis of the kidney will escape from the catheter and usually with relief from the pain or discomfort. On the other hand if after distending the pelvis of the kidney with the fluid the catheter is slowly withdrawn the fluid will escape until the eye of the catheter has passed the kink and then the flow will cease and the patient will not be relieved. If more fluid is now injected through the catheter the symptoms are intensified and still it will not return unless the catheter can be pushed further up into the ureter so that the eye is situated above the kink when the distended renal pelvis or renal pelvis and ureter above the kink (as the case may be) will be able to expel the fluid through the catheter.

A spindle or olive enlargement of wax may be made just above or below the eye of the catheter and as an olive tipped bougie it may be felt to hitch over the kink and so aid in its diagnosis and localization. These bougies may also be used as dilators.

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THE CONSERVATIVE SURGICAL TREATMENT OF THE HYPERTROPHY OF THE PROSTATE GLAND IN THE VERY FEEBLE AND AGED

BY JOHN E SUMMERS, JR., M D,

OF OMAHA, NEBRASKA

It has seemed to me that too many experienced surgeons were minimizing the dangers of prostatectomy and in this way creating a tendency among the relatively inexperienced, to underestimate the seriousness of the procedure. More especially is this so when the sufferers are very feeble and aged, and nearly worn out by pain, unrest and hemorrhage.

A little late for many, but fortunate for those who could profit, Dr Charles H Chetwood, of New York, published a paper in the ANNALS OF SURGERY, October, 1906, directing particular attention to "Prostatectomy in two Stages," a most excellent and instructive contribution. He refers to a special class, viz, the feeble and aged suffering from prostatism and its several complications.

There is nothing new in Dr Chetwood's paper, others years ago, in practice, have recognized the value of this procedure in the surgery of the prostate, yet no one so far as I am informed has so directly and so well forced our attention to this "Conservative Operation with Minimum Hazard."

Early in my experience in the surgery of the prostate, I was impressed with the value of conservatism. Some seventeen years ago, a valued citizen of Omaha, much weakened and depressed by the pain and hemorrhage from an enlarged prostate, was subjected to a supra-pubic prostatectomy (the McGill operation). I acted as first assistant, and the operator, coming from a long distance, was one of America's most distinguished genito-urinary surgeons, and at the time the most

* Read before the Iowa State Medical Society, Cedar Rapids, Iowa,
May 15, 1907

experienced American operator in the surgery of the prostate. My judgment expressed then was to drain first but of course as my experience in the surgery of the prostate was so very limited it was given scant attention—in fact I did not then know how valuable the suggestion was. The patient died at the end of a week from a septic pneumonia. From time to time I did this supra pubic operation with varying success. As time went on the technique of the supra pubic operation improved as it did so the mortality diminished until to-day it is a very safe procedure.

The Bottini and Chetwood galvanic cautery operations certainly have their place when patients are in a weakened state.

Each case has its own personal equation comprehending the important features bearing upon it. Amongst these features of accepted importance we may cite the age and general vitality of the patient. It stands to reason that other things being equal statistics confined to patients seventy or eighty years old should show a relatively high degree of mortality. Again the kidneys bear so important a relation to the immediate condition and future outlook of every prostatic about to be operated upon that the greater the damage already to these organs the less can they be expected to withstand any additional strain consequent upon operation.

If we sum up briefly the dangers and difficulties to be contended with in prostatic operations as urinary suppression, secondary shock and general toxæmia and in especially congested prostates—profuse hæmorrhage the mortality rate or hazard should bear a more or less direct relation to the existence of these features in any given case. (Chetwood)

Commencing about four years ago after I had learned to do a perineal prostatectomy properly I began occasionally in bad cases to separate the operative procedure into first a preliminary supra pubic cystotomy and later one week or maybe one month to remove the prostate through a perineal wound. My reasons for following this sequence may be summarized in this way

Preliminary supra-pubic cystotomy is preferable to preliminary perineal cystotomy

First —It allows of a more thorough examination of the bladder for stone or other complications As an illustration An elderly gentleman, a sufferer from prostatism, had his prostate and bladder explored by means of a perineal urethrotomy The operators were competent, as evidence, one was an ex-president, the other later, president of the American Genito-Urinary Association These gentlemen decided that prostatectomy was inadvisable because of the inflamed condition of the prostate The man came to Omaha Shortly after the perineal wound closed, an enormous stone, evidently of years' formation was removed from his bladder by supra-pubic cystotomy This stone could not have been overlooked had the original exploration been by the supra-pubic route

Second —It allows of a more peaceful drainage there being less irritability than from the presence of a perineal drainage tube

Third —A properly performed supra-pubic cystotomy, if partly closed after the method of Gibson, making a valvular fistula, admits of drainage and irrigation without discomfort, allows of change of position in bed, even getting up early, thus lessening the dangers of hypostatic pneumonia, and bettering the appetite and digestion

If the patient for any good reason, either upon his part or upon your own, decides not to go farther, you have done the best that the circumstances admitted of

Perineal drainage under such circumstances will be impracticable

The prostatectomy may be either supra-pubic or perineal It is a matter of choice in the experience of the individual operator My preference is for the perineal route, but I must confess I am beginning to waver, but only a little As to the choice of methods of the perineal prostatectomy in all patients who have been previously drained supra-pubically, I have strong opinions First, if the prostatectomy is done soon after the supra-pubic cystotomy, any method may be pursued, but if

there is an old supra pubic wound or scar of a month or of years existence then I believe the intra urethral attack upon the prostate is the better as offering less danger of recto vesical fistula either resulting immediately or later from sloughing. The reason is obvious because the bladder firmly attached to the anterior abdominal wall does not admit of the prostate being drawn as near the surface of the perineum as when no such relation exists. Therefore the separation of the prostate from the rectum and its enucleation is more difficult. In the intra urethral attack Bryson's Operation no such danger usually exists at least it should not except possibly in malignant disease.

I wish to refer briefly to several from among my cases which I have chosen in illustration of what has been said.

CASE I—Mr J M S 66 widower Papillion Neb admitted to hospital May 30 1905. Urine draining through a supra pubic opening made by me two years previously as a preliminary to a supra pubic prostatectomy—the latter temporarily refused. Pain loss of sleep and hemorrhage had finally determined the man to seek relief through a further operation. Temperature 99.8 F pulse 80. Urinary examination demonstrated a chronic interstitial nephritis. Urotropin and sandal wood oil were given copious draughts of water were insisted upon. The patient was kept under this preparatory treatment for five days during which time the temperature and pulse varied from normal to 101.8 F and 96 respectively.

A perineal section (Murphy type) was made June 5th and the prostate removed. The temperature and pulse were normal the second and third days following the operation. From the fourth to the eighth days the temperature and pulse rose and fell irregularly varying from 98.4 F to 102 F and from 76 to 102. From the eighth day on the temperature and pulse remained normal. The patient was discharged July 18th perineal wound draining feebly supra pubic wound closed. Continence with closing of perineal wound soon followed. The patient died one year later from endocarditis having had very little bladder trouble after leaving the hospital.

CASE II—Mr B S 76 married Chadron Neb Admitted

to the hospital July 9, 1905, after making a railway journey of four hundred miles. He was very weak and suffered from pain, loss of sleep and hemorrhage. The preliminary treatment was similar to that of Case 1, with the addition of strychnin hypodermically, and was continued for four days, the temperature and pulse varying from 98.4°F to 99.6°F , and from 70 to 86. July 13th, the patient having recovered from the effects of the journey, the prostate was removed through a perineal incision (Proust's operation). For eight days following the operation the temperature varied from 99.8°F to 102°F , being usually 100.5°F to 101°F , while the pulse during that time was proportionately lower, never being above 100, usually 86. The temperature became lower, ranging from 98.4°F to 100.4°F , while the pulse went up steadily. The patient died July 27th.

I have thought that had I done a preliminary supra-pubic cystotomy, the final end might have been long postponed.

CASE III—A C B, 78, widower, Omaha. For past twenty years or more the patient had used a catheter, gradually using it more often. May 29, 1906, the patient found that he could not succeed with the catheter and called a near-by physician who found it necessary to use a metal catheter many times during the two days following. June 1st, after much difficulty, the physician discontinued trying to pass the catheter, as he encountered considerable bleeding and the patient had grown weak, the patient was sent to the hospital. A supra-pubic cystotomy was done at eight P M, June 1st. The bladder drained well for three weeks, the pulse and temperature going up and down irregularly the first two weeks, but gradually becoming regular. There was great difficulty in getting the bowels to move because of the large irritable prostate.

June 3rd, perineal section was made, and the prostate removed (Bryson's operation). The temperature and pulse varied irregularly from 98.8°F to 102.4°F and from 86 to 116. The patient developed a periurethral abscess. This was opened July 15th, and drained, from which time recovery gradually followed.

At present he gets up two or three times a night to void—can retain urine five hours—and voids about the same number of times during the day.

Patient's general condition is very good at this date.

CASE IV—A stout, but fairly rugged Italian, age 83, resident

of Omaha had used the catheter for many years but recently had had several attacks of retention. He was brought to the hospital June 15 1906 by his physician Dr Womersley who finally in the last attack was unable to relieve him. I did a supra pubic cystotomy (Gibson). An enormous hydrocele on the right side was the source of great annoyance. On the eighth day after the cystotomy I did a radical operation for the cure of the hydrocele and also removed the prostate by perineal section (Bryson's operation). The patient could not be controlled he was up and out of bed the first day after the operation and nearly every day thereafter. He remained in the hospital six weeks. A recent report from the old man says that he is in splendid condition. It was impossible to give him quieting medicine of any kind he would not allow a hypodermic injection he would not take pills or capsules and would only take liquids after insisting that the nurse swallow some first.

All of these cases had large prostates and represented the type of bad risks which in my judgment demand conservative surgical treatment. In common with others I have had numerous brilliant successes following immediate complete operations in this and other fields but too often a failure has occurred which might have been averted by a two stage operation.

EPITHELIOMA OF THE PENIS AN ANALYSIS OF ONE HUNDRED CASES.

BY J DELLINGER BARNEY, M D,

OF BOSTON, MASS.,

Assistant in Anatomy, Harvard Medical School, Assistant Genito-Urinary Surgeon
to the Boston Dispensary

THIS paper is based on a study of 100 unselected cases of epithelioma of the penis. Of this number 93 were taken from the records of the Massachusetts General Hospital during the 33 years from January, 1872, to January, 1905,¹ the remaining 7 were gathered from private sources²

This investigation was undertaken

1 To see what end results have been obtained after operation

2 To present what clinical facts have been observed in a study of so large a number of cases

Accordingly the hospital and private records have been thoroughly analyzed, and each case has been followed as far as existing clues would permit. This has involved the searching of state and town records, personal interviews, and a profuse correspondence with the patients, their relatives, and local authorities. As a result 90 per cent of the cases have been traced to a definite end. When it is stated that just 50 per cent of this series were operated on previous to 15 years ago, and that nearly 25 per cent were seen prior to 25 years ago, the results of this search are not discouraging. This paper is unique, in that never before, so far as I know, have as many as 100 cases been so critically examined, and followed to their end results

¹ My hearty thanks are due to the surgeons of the Hospital Staff, past and present, for permission to use these cases

² I am deeply grateful to Drs F G Balch, H H A Beach, W A Brooks, F B Harrington, Horace E Marion, J C Munro, and M H Richardson for the use of cases from their private records

ETIOLOGY

(a) Contributing causes

Frequency—As already noted 93 of these cases embrace 33 years of the existence of the Massachusetts General Hospital giving an average of only about 2.8 cases yearly. Taken in decades these cases are found to have been seen at the hospital with increasing frequency as the following figures show 1872-1882 21 cases 2.1 cases yearly 1882-1892 29 cases 2.9 cases yearly 1892-1902 30 cases 3.0 cases yearly 1902-1905 13 cases 4.25 cases yearly Total 93 cases

A search for additional cases to complete my series of 100 disclosed the fact that many surgeons of large experience had had no case of cancer of the penis in their practice

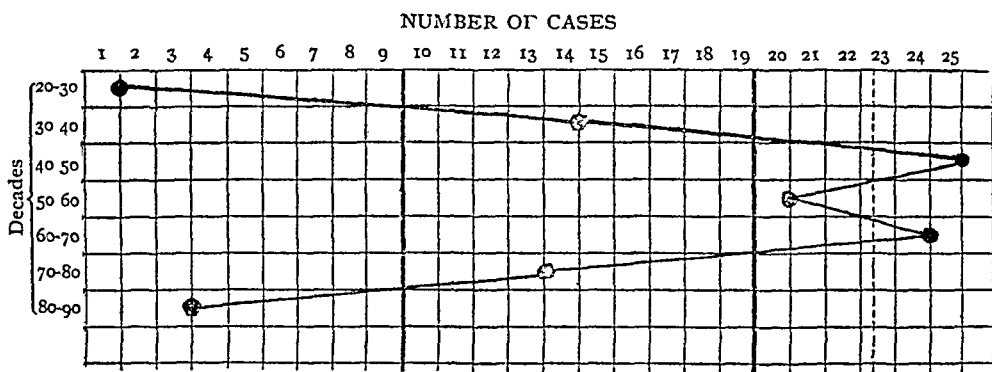
Andrews in 7881 cases of primary cancer in all regions saw only 62 of cancer of the penis or 1.7. Paget states that it forms but 1 per cent of all cancers. Von Winwarther 2.5 per cent while Billroth puts it at 3 per cent. Sawtelle in the United States Marine Reports for the 5 years ending June 1891 saw but 7 cases out of 70,826 cases treated. Cancerous disease of the penis is therefore rare.

Age—In this series the two extremes of age during which cancer may occur were illustrated by a man of 25 years on the one hand and a man of 82 years on the other. A search of the literature reveals a case of carcinoma of the penis occurring in a child of two years reported by Crete (I quote this statement simply on its own merits. Undoubtedly the interpretation of the term carcinoma used by Crete differs widely from that used by the majority of pathologists). Curtis mentions a case of Weir's occurring at 18 years of age. Kaufmann from an analysis of 227 cases states that it is most common in the 6th decade and after that in the 5th and 7th. In 3 out of 130 cases he found the age to be between 21 and 30 years. Demarquay in 134 cases saw 9 between 20 and 30 years of age. He quotes Ricord on the other hand as saying that he never saw a case under 40 years of age.

Taken by decades these cases are as follows 20-30 years

1 case, 30-40 years, 14 cases, 40-50 years, 25 cases, 50-60 years, 20 cases, 60-70 years, 24 cases, 70-80 years, 13 cases, 80-90 years, 3 cases Total cases, 100

Graphically presented this gives a rather interesting curve



The average age was 56.02 years

Civil State—Of these 100 cases, 85 were, or had been married, while only 11 were single. The state of the remaining 4 was not recorded. In a measure this fact is of little importance, as most men by the time they reach middle life have married. But as almost every treatise on cancer of the penis states that the disease may be the result of contact with a cancerous cervix, I give these figures so that inferences may be drawn.

Contact with Cancerous Cervix—In this series there was not even a suggestion of this being an etiological factor. Demarquay cites one case which seems to have been acquired in this way. He also quotes examples of cancer of the cervix where coitus had taken place over a long period of time with no implantation on the penis. Martin quotes McFarland, who searched the literature most thoroughly, and found eight cases which, as far as anyone could tell, were undoubtedly due to contact with a cancerous cervix. Bruce cites the case of a man of 58, whose wife died of cancer of the uterus of many years' duration. The man developed a cancer on his penis during the year following her death.

Occupation—The question of occupation is of no great

importance Almost every trade or profession has its representative as follows Laborers 16 carpenters 10 shoemakers 7 farmers 7 machinists 5 merchants 4 sailors 3 butchers 3 clerks 3 printers 2 grocers 2 Total 62

The remaining 38 cases all followed as many different callings The large number of laborers is of little significance as hospital patients are drawn largely from the laboring classes and the fact that the disease occurs in so many different sorts of workers is sufficient to throw out occupation as a contributing factor The fact that it occurs mostly in those who do hard manual work might lead one to suppose that trauma played its part In the records of these 100 cases only 13 had been questioned particularly on this point Of these 13 only 3 recalled having any injury to the penis

Nationality —The nationalities of these cases are as follows Americans 53 Irish 25 English 16 Germans 3 Italian 1 unknown 2 Total 100

It is worthy of note that the Jewish race does not figure in this list of nations This is all the more notable when we consider that these people contribute generously to the files of almost every other disease But is it only a coincidence that a race whose men have been circumcised from time immemorial does not appear in this series?

Other writers (Travers Patterson) have also noted the immunity of the Jew from this disease It is also curious that this series includes no negro I have found no mention of the fact that the negro is exempt from cancer of the penis and I have no explanation to offer for it In a search of the literature I find but one case occurring in a negro I do not mean to say that this disease is rare in the negro His absence from this series is perhaps explained by the fact that in these parts negroes form a small percentage of all cases

Heredity —This as in cancer elsewhere seems to play little or no part in the etiology as in this series only 1 case had a family history of cancer but that curiously enough was of the penis in the man's father

(b) Immediate causes

The term "immediate" causes is somewhat ambitious perhaps, for cancer of the penis, like all other cancer, arises still without known cause. Under this heading however I have grouped those clinical facts which seem to me to have the most important bearing on the origin of the lesion. They are arranged in order of importance.

Phimosis—This condition is conceded by practically all writers to be the most important factor in cancer of the penis. In this series note was made of the presence or absence of this condition in but 42 cases. Of these it was absent in 6, present in 36, or over 85 per cent. In most of the 36 the patient said he "was never able to retract his foreskin," a fact which would indicate a congenital phimosis, or one of many years duration. My findings are in accord with those of Demarquay, who noted phimosis in 42 out of 59 cases. When we consider that a phimotic condition causes a retention of smegma, or of a few drops of urine, both of which rapidly decompose, and that as a result of this ever-renewed condition the glans and foreskin are constantly bathed in a foul, acrid discharge, it is not surprising that the soil is fertile for malignant as well as for benign growths. In fact Kaufmann goes so far as to say that in elderly men with phimosis, and a foul discharge under the prepuce, the possibility of cancer should always be born in mind, even without the presence of induration. Furthermore this chronic balanitis is frequently associated with the so-called "venereal wart," and according to Kaufmann 29 out of 33 cases of cancer of the penis collected by him began with what were apparently these simple vegetations. The observations of other writers are similar to this.

Here again I must lay special stress on the fact that a large number of these cases had phimosis with its concomitants, and that not a single circumcised Jew was found in the 100 cases. This seems to my mind a most convincing argument in favor of circumcision, in all those cases where the prepuce cannot be easily and completely retracted.

Venereal Disease—The number of cases in this series in whom the history of previous venereal disease was sought for

was 49 Of these 22 acknowledged it while 27 denied it Unfortunately the records stated in only a few instances whether the venereal disease was in the form of gonorrhœa chancroids or syphilis Two cases however gave a definite history of a specific lesion on the penis and stated with certainty that the cancerous process had begun on the site of the chancre

CASE I—Age 69 years married hotelkeeper Entered Dr C B Porter's service in November 1894 Contracted syphilis 35 years before entrance Two and a half years previous to entrance he noticed a little ulcer on the prepuce in front of the corona on the site of the chancre Says he has had three or four similar ulcerations on the same place lasting a few days during the past 25 years This last ulcer continued steadily in spite of treatment Examination showed a large hard ulcerating mass in the prepuce and on the glans The growth has ulcerated so that there is a large cavity mostly in the dorsum and left side of the penis Glands in both groins enlarged

CASE II—Age 46 years married moulder Entered the service of the late Dr John Homans in May 1886 Twenty two years before entrance he contracted a sore on the penis The sore was cauterized In the fall of 1885 a red bunch appeared in the scar and this has been cauterized many times since because of its increase in size Examination showed the glans penis to be nearly destroyed by epithelial growth

My findings are substantiated by those of Cripps who reports 1 case in which epithelioma developed in the scar of a syphilitic ulcer and by Martin who cites a case developing in the scar of a chancre 9 years after the appearance of the initial lesion Still another case is reported by Sibley of a man of 35 who had a chancre This was entirely healed under specific treatment When 62 years old a slight redness developed on the site of the chancre This went on to ulceration and at the age of 69 years the man died of cancer Demarquay places syphilis second in order of importance of the contributing factors and records 10 cases of it out of a series of 59

It will thus be seen that venereal disease especially syphilis undoubtedly plays a part in the etiology I have found no

case that could definitely trace its origin to a chancroid, nor have I seen any mention of the subject in the literature

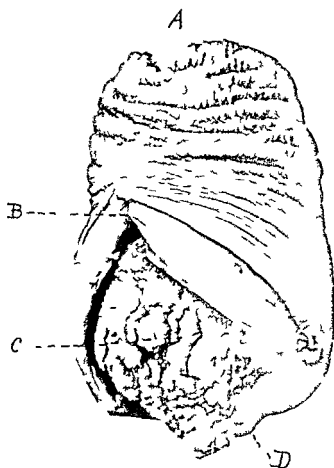
Trauma—Only 13 of these 100 cases were questioned in regard to trauma. Three only, had had any definite injury. There were, however, 6 cases who had had previous circumcision for one reason or another, and who said that the wound of this operation had either never healed, or that the cancer had first begun in its edges. This surely is a form of trauma, and in these cases it was apparently the beginning of the trouble. We are forced therefore to give some value to trauma as an exciting cause of cancer.

CLINICAL COURSE OF THE DISEASE

Character of the Growth—There are according to all writers (more especially Jacobson) two types of growth, the cauliflower or proliferating, and the ulcerating, with indurated edges and rapidly destructive properties. Clinically it is frequently impossible to differentiate these two types on account of their mixed character, especially to be seen in those of long duration. This classification has been still more difficult to make from the imperfect records alone. In doing this many doubtful cases have been excluded. The rest arrange themselves as follows. Cauliflower-like growth, 46 cases (Fig 1), ulcerative growth, 35 cases (Fig 2). It is thus seen that the cauliflower growth is the commoner of the two. Thomson also takes this view.

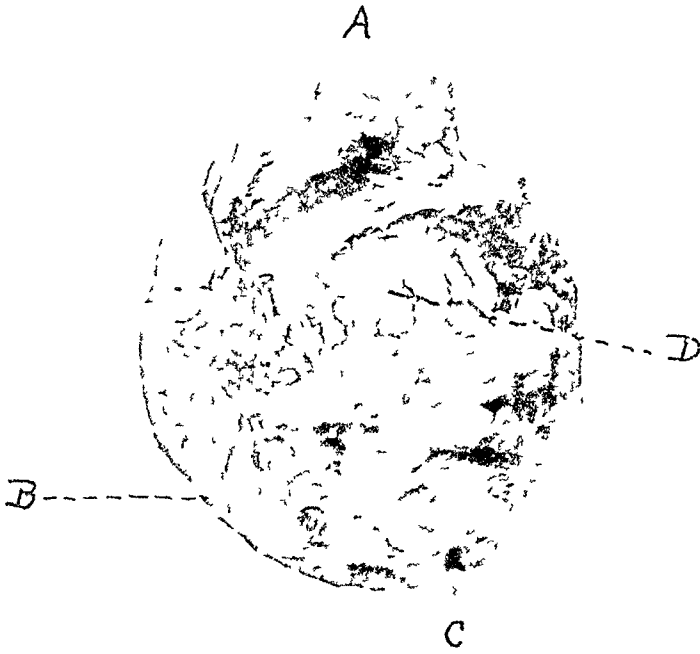
Condition of the Growth—Inquiry as to whether the growth was ulcerated shows that in 77 cases where the fact was recorded, 65 were ulcerated, and 12 were not. From this it is readily seen that the cauliflower growth goes on to ulceration. It is scarcely necessary to say that all those cases which were ulcerated had a foul, sanguino-purulent discharge, but the large cauliflower growths were also bathed in a creamy, acrid secretion. A few cases gave a history of frequent hemorrhages from the growth, some being a mere capillary ooze, others being an affair of some severity from erosion of the erectile tissue.

F c



C 1 g g th l g gl (C) Am l d y f p A d l
 l th gh p p t B Meat t D p c m f m W M m

FIG 2



Ulcerative type of growth involving glans and prepuce (D) Amputated extremity of
penis at A, edge of prepuce at B, meatus with bougie inserted at C Specimen from Warren
Museum

FIG 4



Growth of cauliflower type involving both glans and prepuce but more especially the glans. Patient 52 years old duration 2 years, urination through several fistulous openings in growth small glands in groins. Amputation at pubes, both groins dissected. Death from apoplexy a few years later. Case of the late Dr. John Homans.

Starting place of the Growth — Demarquay says that these lesions start most frequently on the glans penis while Thomson not only agrees to this but localizes the growth to the dorsal aspect of the glans near the corona. He puts the preputial reflection next in order of frequency. Kaufmann an indisputable authority says that out of 33 cases he observed the growth 20 times on the prepuce and 13 times on the glans.

My observations show that in 65 cases where there was any definite statement on this point 45 or over 69 per cent had started on the glans while 24 had their origin on the prepuce (in its mucous membrane). Many had started in the sulcus behind the corona glandis while others had started near the frenum at its junction with the glans. In a few cases the growth was still limited to its point of origin but in most it had spread so as to involve both glans and prepuce (Figs 3 and 4).

Urinary Symptoms — It is quite reasonable to suppose that a malignant growth in the region of the meatus and the urethra should cause some urinary symptoms. As a matter of fact such symptoms were present in a majority of the cases in this series who were questioned on the subject. In 39 information on this point was obtained in 22 there was a story of some abnormality of micturition in 17 no trouble existed. These urinary difficulties included complete retention (only however in 1 or 2 cases where previous amputation had been done) frequency burning small stream incontinence and urination through fistulæ in the growth. Many if not most of the symptoms were undoubtedly caused solely by the disease but some of them such as retention frequency small stream and incontinence might perfectly well have been due to prostatic hypertrophy (which doubtless was present in as large a per cent of the men of this series as in any similar number of men of this age) or to stricture of the urethra. According to Demarquay retention of urine is not infrequent in cancer of the penis but where the anterior urethra alone is affected urinary fistulæ are established whereby urine may escape. In none of these cases had the lesion begun in the urethra or even at the meatus so that the urethral occlusion when it existed was due

to extension of the growth, to œdema of the parts, or to the contraction of scar tissue In regard to this point Keyes says

“Locally the growth may spread over quite a large superficial area without involving the corpora cavernosa, whose sheaths stoutly resist invasion, while it has frequently been noted that, though the entire glans may be involved in the disease, the corpus spongiosum is usually spared, and urination unimpeded If, however, the canal does become obstructed the urine usually manages to find its way through one or more fistulous openings in the floor of the urethra”

I would say that urinary symptoms are practically all seen only in the later stages of the disease, when the growth has invaded the body of the penis and distorted the urethra

The subsequent divisions of this subject will consider the cases in two groups, primary and recurrent The former had never had a previous operation for cancer of the penis, of the latter all had been operated on once, some of them several times for the removal of the disease

There were 74 primary cases, and 26 recurrent cases

Duration—In patients of the class which makes up the largest part of this series, accurate observation is rare Furthermore in this disease which begins so gradually, so painlessly, and so entirely lacking in initial symptoms, there is room for much error as to the time of onset I would further emphasize the difficulties of observing any growth under a congenitally tight prepuce, which many of these patients had, until it has gained very considerable headway However such figures as have been obtained in regard to the duration of the disease are interesting

Primary Cases—Under 1 year, 38 cases, 1–2 years, 18 cases, 2–3 years, 5 cases, 3–4 years, 3 cases, 4–5 years, 2 cases, over 5 years, 4 cases, unknown, 4 cases Total, 74 cases

Recurrent Cases—The figures of these cases are very similar to those of the primary cases, the time in both applying to the duration from the first symptom to the final operation recorded Several cases had had more than one recurrence, to remove which attempts had been made at successive operations

Under 1 year 4 cases 1-2 years 7 cases 2-3 years 6 cases 3-4 years 1 case 4-5 years 1 case over 5 years 6 cases unknown 1 case Total 26 cases

It is to be seen that in either column the figures tend to taper toward the middle indicating either a very rapid or a very slow growth

I wish to call attention especially to the important fact that while most cases have a duration of one two or three years yet there is in this series a total of 4 cases with a duration of from 3 to 4 years 3 cases with a duration of from 4 to 5 years and most striking of all a total of 11 cases of over 5 years duration Many of these latter had existed for a very much longer time than 5 years

The disease is therefore one whose duration is most uncertain and in any given case it is practically impossible to say what the outcome is to be

Another point of interest is that the two types of growth previously described have a different duration Analysis shows the cauliflower like growths to have had an existence of about 24 months while that of the ulcerative type was only 16 months

Pain—Unfortunately the question of pain was considered in but 48 of these cases In 21 or 43.5 per cent pain was present in 27 or 56.5 per cent it was absent Considered under the headings of primary and recurrent cases the figures are as follows *Primary Cases*—Present 16 or 44.5 per cent Absent 20 55.5 per cent Total 36 *Recurrent Cases*—Present 5 41.5 per cent Absent 7 58.5 per cent Total 12

These figures although only approximate for each group of cases show a striking similarity and it is to be noted that in each group pain was absent in a majority of the cases It is therefore not a constant symptom and in no case was it evident that it had been severe enough to cause much suffering The pain was also not especially characteristic In most instances it was sharp and darting and was localized chiefly to the penis in the region of the growth In other cases it was described as being felt mostly in the groins testicles or legs and was of

a dull, dragging character It was also noted that the pain of whatever character or intensity was one of the late symptoms, appearing in many only after the growth had existed for several years This feature is best shown by the fact that the percentage of those having pain was even less in the recurrent, than in the primary cases

Lost of Weight—Information on this point was obtained in only 14 cases as follows

Primary Cases—Present 7, or 100 per cent Absent 0
Total, 7

Recurrent Cases—Present 2, or 28 5 per cent Absent 5,
or 71 5 per cent Total, 7

The figures are too small in each group to be of much value, but such as they are it is interesting to see that a total of 9 had definitely lost weight Of these, 7 were primary cases In other words, loss of weight had occurred in every primary case where the fact was known Five cases, all in the recurrent group, had not lost weight, a fact which is contrary to every expectation "*Ubi gentium sumus*"

Glandular Involvement—In 66 cases note was made of the condition of the inguinal glands They were pathologically enlarged in 50 cases or over 75 per cent, while in 16 no enlargement could be made out The enlargement was mostly unilateral, and as a rule the glands were enlarged on the same side which the primary growth was on, but in not a few cases they were involved on the side opposite the lesion This is explained by Keyes who says

"The lymphatics of the penis so anastomose that a so-called cross-bubo, the sore on the one side of the penis, and the bubo in the opposite groin, occurs not infrequently"

It is well known that the disease is often slow in reaching the inguinal glands, and also that after reaching them it is as often equally slow in spreading further In a case reported by Taylor the penis was amputated without removing the glands after the tumor had existed for 6 years, and the patient stayed well for 10 years more That the glandular enlargement may be due to pyogenic, as well as to cancerous infection,

is shown by the fact that out of 20 cases in which the glands were dissected out and in which there was a definite pathological report 8 or 40 per cent showed only simple hyperplasia due to absorption from the ulcerated and infected growth on the penis. The remaining 12 or 60 per cent proved cancerous. Furthermore in several cases presenting glandular enlargement where only amputation of the penis was done the post-operative record showed that there was a marked diminution in the size of the glands. This was evidently due to the removal of the infected focus but of course does not show that there was no malignant infection as well.

Practically all writers agree that invasion of the inguinal glands is more frequent than is generally supposed. In 48 cases examined by Kaufmann the inguinal glands were found to be free from cancer in only eight. Martin quotes Gussenbauer who says that the inguinal glands are with few exceptions involved very early and that even though not palpable the microscope generally shows cancerous metastasis. In 48 cases examined he found the glands to be involved in 40 of which 30 were bilateral and 10 unilateral. Kuettner found glandular enlargement in 71 per cent of 60 cases but in only 32 per cent were the glands cancerous. He observed 16 cases with no recurrence after operation and of these not a single case had glandular involvement at the time of operation.

A point of importance in regard to glandular involvement is that although there may be no demonstrable metastases in the inguinal gland yet there may be internal metastases. Kuettner speaks particularly of this point. Certain cases in Von Bruns' clinic died of pelvic metastases after amputation of the penis and thorough dissection of the inguinal glands. Being unable to find an explanation of this in the anatomies Kuettner made a number of injections and found that merely the superficial lymphatics of the penis empty into the inguinal glands while the deep ones follow the blood vessels and empty directly into the nodes situated in the pelvis. This is a point of the utmost importance in considering the prognosis. I know

of no way however of predicting this catastrophe, or of diagnosing it antemortem

Paget said, "The diseased glands are enlarged, hardened, smooth-surfaced, and usually retain their natural connection with the surrounding tissues"

Modern observers go farther than that, for it has been found that in their progress the cancerous inguinal glands may gradually assume a form similar to one of the two types of growth on the penis, the cauliflower-like or the ulcerative. Two cases illustrating this phenomenon have been observed by Taylor. In the first case "the new growth in the glandular structures was very exuberant, and a very large, subcutaneous, lobulated mass was produced which caused ulceration in the skin. Though the superficies of the mass underwent decay its central portions retained their integrity. During its development there was erosion of one or more arteries." In the second case "it seems probable from the history that the cancerous glands underwent acute inflammation, that suppuration ensued, and that they were thus extruded. Around them the malignant action had established itself in the skin, or connective tissue, or both. The morbid process in the first case was quite sharply limited to the glands, with perhaps some secondary skin change, in the second case it began in the glands and destroyed them, then spread to the overlying and surrounding skin."

My findings agree with those of Patterson. He says that the inguinal glands are invaded both by inflammatory and cancer cells. Without operation these glands go on to suppuration, leaving large ulcers which are infiltrated with cancer and as malignant as those on the penis. Because of this double infection operative interference meets with three difficulties:

- 1 The free communication between the very numerous glands, and their intimate association with important structures

- 2 The adherence of the glands to surrounding parts by inflammatory exudate

- 3 The softening of the glands by inflammatory products which render their complete extirpation difficult. Small bits of

cancerous gland tissue are left behind and these act later as foci of recurrence

In connection with glandular involvement I note for the sake of completeness the

Involvement of the dorsal lymphatics of the penis

In only 5 cases was the condition of these superficial lymphatics observed but in all they were like hard fibrous cords running up to the pubes toward one groin or the other. One of these was a recurrent case the other four primary cases. In another recurrent case having 4 operations in as many years a hard fibrous cord was noted running from the metastatic growth in the groin toward the umbilicus. As the lymph stream offers the principal channel by which metastases can occur in cancer it seems strange that the lymphatics were not noticeably indurated in a greater number of cases. However as in many the entire penis was edematous and indurated as far back as the pubes it would be easy for any one lymph channel to escape notice. Moreover it has been shown by Kuettner that the deeper lymphatics may be the only ones involved. It must also be remembered that the involvement of the superficial lymphatics may be only microscopical.

Thomson says in regard to this point that one of the 3 methods of backward extension of a cancerous lesion on the penis is by the main lymph channel in the dorsum. Later on however he says that in transverse sections of the penis in cases in which the disease of the glans was well advanced he was unable to observe cancerous emboli in the lymphatics like those demonstrated by Stiles in the lymphatic vessels running from the breast to the axilla in cases of mammary cancer. In other words Thomson says there was no anatomical explanation in the specimens studied by him for the early infection of the inguinal glands.

I would add that as the cancerous growth on the glans is usually infected by pathogenic bacteria this fact in itself might account for the induration of the lymphatics.

Evidence of Internal Metastases—Those metastases (beyond the inguinal glands) which were demonstrable at the

time these cases were seen, were all limited to the pelvic organs. In two cases the entire spermatic cord was much enlarged and indurated, especially its inguinal portions. In 5 cases there was unmistakable clinical evidence of cancerous growths in the rectum, prostate, and vesicles, and in one of these cases, the whole perineum was riddled with sinuses and cancerous nodules.

As regards metastases in the abdominal and thoracic organs and the central nervous system, it is said by all writers that such deposits are exceedingly rare. As I have said before no case in this series had such metastases demonstrable when seen.

According to Kaufmann the internal viscera have been seen to be secondarily infected by Von Winwarther, Ricord, and Louis each in one case, and by Lebert in two cases. Curtis, Kuettner, Wilson, and Kocher each report a case with autopsy, making only 9 cases in all, so far as I have seen in a comparatively scanty literature.

In this series so far as known, one case in the recurrent group, and four cases in the primary group dying of cancer, had internal metastases. In other words, over 15 per cent (32 of these 100 cases died of cancer) had metastases in the vital organs. This is contrary to the statements of other writers, and we can say that internal metastases are by no means uncommon. Unfortunately I have no knowledge of any autopsy on any of these cases who died of cancer. The diagnoses were clinical, made by the attending physician. In one case a large mass was felt in the region of the gall-bladder.

In the cases reported in the literature metastases took place in the central nervous system, lungs, heart, liver, and stomach.

It is fair to say therefore that death in epithelioma of the penis results usually from general cachexia, induced by inguinal or pelvic metastases, but in over 15 per cent of cases it is due to invasion of some vital organ.

Implantation of the Growth—In one case there was a large cancerous ulcer on the scrotum, arising from contact with

it of the lesion on the penis This together with the fact that in a large majority of these cases the cancerous process had spread from glans to prepuce or vice versa illustrates the ease with which cancer is implanted on adjacent parts

PATHOLOGY

Epithelioma of the penis may begin in one of several ways

1 As a simple wart Kaufmann states that in 29 out of 33 cases he saw the disease begin in this way Nine cases of this series are known to have commenced thus

2 As a pimple in which case it is usually situated near the lymphatics Nine cases had this origin

3 As a superficial excoriation or raw patch There were 4 cases of this

4 More rarely as a true ulcer Eight cases started in this way

5 Very rarely begins in the urethra (*i.e.* meatus) or spreads to the penis from the scrotum In 134 cases Demarquay found the urethra involved only twice

Fifteen of this series said that the trouble began with a hard smooth lump which progressed more or less rapidly to its final form Two cases noticed first a little scab on the glans two others had their attention first called to the trouble by a sanguino-purulent discharge from under the tore skin

Thomson has something to say in regard to the existence of precancerous conditions of the epithelium of the penis It may present one or both of the following changes

1 A catarrhal condition (balanitis) in which the surface layers are shed the deeper layers are permeated by leucocyte infiltration and the subjacent connective tissue shows great increase in vascularity

2 More frequently a marked thickening of the surface epidermis along with a rich infiltration of small cells in the sub epithelial connective tissue The overgrowth of surface epidermis may be uniform or papillary or may present complete branched filiform processes It ceases abruptly at the edge of

the cancer These conditions of surface epidermis are similar to those observed in the lip and tongue in association with cancer, and have been described by Schuchardt and others under the name of "psoriasis preputialis"

Epithelioma is practically the only form of cancer attacking the penis Its microscopic appearance is that of any squamous-cell cancer, and I have nothing further to add in regard to it As already shown it may assume one of two forms, the cauliflower-like, or the ulcerative Its manner of growth when attacking the inguinal glands has also been touched upon

A case of "medullary cancer" of the penis is described macroscopically and microscopically by Kilgarriff, occurring in a man of 55 The duration was four months Gould reports a case of melanotic epithelioma of the penis occurring in a man of 75 years, with 5 years duration Both Paget and Billroth described such a growth, but it is evidently an almost unheard-of thing Medullary cancer of the penis occurs apparently with equal rarity

MODE OF EXTENSION OF THE DISEASE

Although I can say nothing from personal observation about this matter, I think it worth while to state that there is still a good deal of uncertainty on this point So great an authority as Kaufmann could find no evidence of penetration of cancer in the erectile tissue spaces Thomson takes an opposite view, and mentions a specimen in the Hunterian Museum in London which proves his point It is undoubtedly true, however, that the stout fibrous sheaths of the corpora cavernosa resist invasion for a very long time, but the late invasion of erectile tissue may be accounted for also by the tendency of the growth to proceed in the line of least resistance, heaping layer upon layer on its surface, forming the cauliflower mass

The disease extends backwards in one of three ways

- 1 By extension along the main lymphatic vessels in the subcutaneous tissue of the dorsum of the penis, and continuous with the primary growth

2 Penetration (in time) of the erectile tissue by epithelial prolongations forming continuous cancerous infiltrations of the blood spaces

3 More rarely by the development of outlying foci or secondary nodules of cancer in the erectile tissue perhaps at some distance from the primary growth

The last two types of the extension of the disease were shown fairly well by the experiments of Kuettner previously mentioned

The first type shows that amputating the penis by leaving a dorsal flap should be abandoned for in making the latter the main lymphatic trunks are included

An examination of many specimen by Thomson shows that as a rule the cancer tends to be localized for a long time to its original site and that so far as local recurrence is concerned it should be easy to prevent this by an early amputation Epithelioma originating in the prepuce itself shows the least tendency to extend backwards along the body of the penis

RECURRENT CASES

As stated above there were 26 recurrent cases in this series A few had had more than one operation for the removal of the growth Horteloup says that recurrence usually takes place during the first year after operation but that it has been seen during the second year Guyon cites a case occurring after 3 years

My figures are as follows Under 1 year 12 cases or 39 per cent Some had more than one recurrence 1-2 years 6 cases or 19 per cent Some had more than one recurrence 2-3 years 5 cases or 16 per cent 3-4 years 2 cases or 6 per cent 4-5 years no cases Over 5 years 4 cases or 14 per cent Unknown 2 cases Total 31 cases

I wish to call special attention to the fact that in these 26 cases 2 or over 6 per cent recurred between 3 and 4 years and 4 cases or over 12 per cent recurred over 5 years after operation These figures offer a striking contrast to the statements of other men

Region of Recurrence—Local (i e, in the penis or its stump), 21 cases, groin alone, 2 cases, local and groin, 3 cases
Total, 26 cases

Previous Operations—Amputation alone, 7 cases, amputation with dissection of groins, no cases, circumcision, 13 cases, excision of the growth, 12 cases, dissection of the groin alone, 2 cases Total, 34 cases

Thus 34 operations were done on 26 cases It is to be noted that palliative operations such as circumcision and excision, were by far the most numerous, and that there was no recurrent case having the radical operation of amputation with dissection of the groins

Final Operations—Amputation alone, 16 cases, amputation with dissection of groins, 4 cases, dissection of groins, 2 cases, excision by curette or cautery, 3 cases Total, 25 cases

One man refused operation and "eloped," dying over 6 years later of "phthisis"

In this group it is to be observed that the more radical operations are preponderant

End Results (of Recurrent Cases)—Living (without recurrence) or cured, 11 cases, 42 per cent, deaths from cancer, 10 cases, 38 5 per cent, deaths from other causes, 4 cases, unknown, 1 case Total, 26 cases

Living (Without Recurrence) or Cured Cases—In this group of 11 cases I have put 3 about whom there is a possibility of error, but whom I personally consider as cured Two cases were seen, one 4 years, and another 8 years after operation by Dr M H Richardson, of Boston, and were found to be perfectly free from any sign of cancer They both died several years later, one of "cystitis with ascending pyelitis," and another of "emphysema of the lungs," and at an advanced age The third case died 9 years after operation, of "heart disease," in old age So far as known there was no recurrence

Of the other 8 cases, I have either seen or corresponded with 4, and of the rest I have heard from their physician or near relative

The operations done on those in this group are as follows

Amputation with dissection of groins 1 case amputation alone 8 cases excision 2 cases Total 11 cases

The pathological report on the cases in this group is as follows Specimen from penis malignant 10 cases glands from groin malignant 1 case Total 11 cases

The average length of life of those in this group (after operation) is about 24 years One man is alive now 30 years after operation

Cases Dying of Cancer—In these 10 cases recurrence is known to have occurred as follows Inguinal glands 2 cases pelvis (rectum perineum etc) 1 case internal (liver) 1 case

The operations done on these 10 cases were as follows Amputation with dissection of groins 2 cases amputation alone 5 cases dissection of groins alone 2 cases excision (curetting of cancerous nodules in perineum) 1 case

A pathological report was made in the excised specimens from these cases as follows Specimen from penis malignant 7 cases glands malignant 3 cases glands non malignant 1 case

The length of life of these 10 cases from the time of onset of the disease was about 8 years and 3 months

The length of life after final operation was 4 years and 2 months Two cases lived only 8 months after 1 case lived 15 years and 5 months after¹

Of the cases dying of other causes there is little to be said except that there was no death immediately following the operation

Primary Cases—The final operations done on these cases were as follows Amputation 46 cases amputation with dissection of groins 16 cases excision 5 cases circumcision 2 cases meatotomy 1 case no operation done 4 cases Total 74 cases

In three of these cases where amputation was done the scrotum was split and the urethra planted in the perineum Total emasculation was done in no case

The end results of these cases are as follows Living

(without recurrence) 01 cured, 27 cases, 36.5 per cent, deaths from cancer, 22 cases, 29.0 per cent, deaths from other causes, 15 cases, unknown, 9 cases, living without operation, 1 case Total, 74 cases

Living (Without Recurrence) or Cured—As in the recurrent group, I have included in this list of 27, 13 cases dying of other cause over 5 years after operation, in whom it is reasonably certain that a cure was established. Of these, 2 were seen by Dr M H Richardson at intervals of 7 and 8 years respectively after operation, and were found to be perfectly well. They died many years later, one of pneumonia, and one of old age. The other 11 cases are those who died over 5 years after operation of other causes than cancer, and of diseases which apparently were not due to internal metastases. These diseases include old age, pneumonia, phthisis, and heart, and kidney affections. As it was shown in the analysis of the recurrent cases, that one died of cancer over 15 years after operation, and that 4 cases had recurrence 5 years, or over, after operation, one might say that it is unsafe to consider any cases cured unless proved by autopsy. But my point is that these cases apparently lived a natural life, which was terminated by other cause than cancer.

Most writers on the results of operations for cancer, have set a three-year limit as the time which must elapse without recurrence, before a cure can be said to have been made. Recent careful investigations by others, and the results obtained in this series of cases, forces us to lengthen this limit to at least 5 years. As a matter of fact my observations make me hesitate to set any definite time-limit.

The operations done on these 27 living or cured cases were as follows. Amputation, 20 cases, amputation with dissection of groin, 5 cases, circumcision, 1 case, meatotomy (for stricture in stump of penis which had previously been amputated), 1 case. Total, 27 cases.

One man refused operation and "eloped." He is still alive although the disease began over 11 years ago.

A pathological report was rendered in these cases as fol-

lows Specimen from penis malignant 17 cases glands from groin malignant 1 case glands from groin non malignant 3 cases

Cases Dying of Cancer—The operations done on these cases were Amputation with dissection of groin 5 cases amputation 13 cases excision 1 case no operation done 3 cases Total 22 cases

The pathological report of these cases is as follows Specimen from penis malignant 15 cases glands malignant 1 case glands non malignant 1 case

Unfortunately I know about the site of recurrence in but 9 of these cases Local (*i.e.* stump of penis) 1 case inguinal glands 4 cases internal (stomach and liver) 4 cases

The average length of life *after the onset of the disease* was 3 years and 4 months the shortest being 9 months the longest 10 years and 5 months

The average length of life *after operation* was 24 months the shortest being 2 weeks the longest 9 years and 3 months

Here again there is little or nothing to be added about the cases dying of other causes except that one died of sepsis in the hospital to be considered if you please as an operative mortality of 1 per cent

OPERATIVE SEQUELÆ

Demarquay gives the following list of untoward operative sequelæ 1 Retraction of stump 2 Retraction of urethral orifice with abscess and fistula of stump 3 Infection (bacterial) of inguinal glands 4 Recurrence 5 Generalization of the affection 6 Aggravation of poor general condition 7 Mental changes 8 Loss of sexual power

Skill or good fortune averted many of these unpleasant consequences in this series Two men had had the penis amputated before coming to the hospital Each had a stricture of the meatus of the stump and this was divulsed The urethra of one of these cases was packed full of small facettted calculi and a second amputation was done

None of the cases that I saw or heard from laid any stress on the loss of sexual power In fact many denied such a possi

bility, and in them it was apparently only a curtailment of their powers. Fortunately this disease and its radical treatment comes at a time when sexual matters are usually not uppermost in the mind.

Some writers, notably Demarquay, say that patients whose penis has been amputated are often seized with profound melancholia, and several suicides from this cause are reported. This depression has been absent, so far as known, from all these cases. On the contrary the tone of their letters, or statements, was one of joy at the new lease of life which the operation had given them. It must be born in mind, however, that the cases on which Demarquay based his observations were of an emotional race, in whom mental instability is not uncommon. The cases composing this series were, as a whole, of an entirely different type.

CONCLUSIONS

1 Epithelioma is practically the only kind of cancer attacking the penis, and its frequency forms only from 1 per cent to 3 per cent of all cancers.

2 It occurs most frequently during the fifth, sixth, and seventh decades of life.

3 Phimosis is preeminently the most important of its exciting causes, occurring in over 85 per cent of cases. Circumcision, therefore, cannot be too strongly advised, especially after middle life, in all cases where the prepuce cannot be easily and completely retracted. Syphilis and trauma are to be considered next in importance from an etiological standpoint.

4 Most cases seek relief during the first and second years of the disease, but it is not unusual to see cases of from five to fifteen years duration.

5 Pain occurs in 43.5 per cent of all cases. It is rarely severe, and usually occurs late in the disease.

6 Enlargement of the inguinal glands occurs in over 75 per cent of all cases. In 60 per cent these glands are cancerous. The rest show simple hyperplasia from septic absorption.

Glandular involvement may occur early, but from my



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study of these cases I am inclined to regard it rather as of late occurrence

Inguinal metastases cause death sooner or later. If well advanced attempts at their removal are to be considered only as surgical vandalism

7 Invasion of the vital organs occurs in over 15 per cent of all cases. It may occur without involving the inguinal glands

8 Recurrence takes place up to one year after operation in over 39 per cent of cases up to two years in over 19 per cent up to three years in over 16 per cent up to four years in over 6 per cent and most notable of all it occurs over five years after operation in over 12 per cent of cases

Its site depends largely upon the original operation performed and will be local where only palliative operations have been done. It may occur several times

9 The operative mortality is 1 per cent. This case died of sepsis a misfortune which might occur in any operation

10 The gross mortality is 32 per cent. That of the primary cases is 29 per cent of the recurrent cases 38.5 per cent

11 Thirty eight per cent of all cases are cured of these the primary cases form 36.5 per cent the recurrent cases 42 per cent

12 Early amputation of the penis at the pubes with thorough dissection of the groins is the operation of choice. If taken in the earliest stages however amputation alone may effect a cure. The operations of splitting the scrotum and transplanting the urethra into the perineum or of total emasculation offer no greater hope of cure

13 The length of life from *time of onset* in primary cases is 3 years and 4 months in recurrent cases it is 8 years and 3 months

The length of life after *final operation* in primary cases is 24 months in recurrent cases 4 years and 2 months

Cases may live for over 11 years after the onset of the disease without operation

14 Sexual power is not necessarily destroyed by amputation of the penis

15 Melancholia (in this country at any rate) rarely, if ever, follows the loss of the organ

16 Amputation, even close to the pubes (Fig 5), does not necessarily cause any disturbance of micturition

17 The patient will be confined to the hospital for about 14 days after the radical operation

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THE BOTTLE OPERATION METHOD FOR THE RADICAL CURE OF HYDROCELE

BY E WYLLYS ANDREWS M D

OF CHICAGO

P fesso f S g ry i th N rthw t rn U ty M d l S hool

OPEN operations for the radical cure of hydrocele may be classed as of three types

1 Packing or tamponade of the sac causing adhesive inflammation

2 Resection of the sac or portions of it

3 Eversion or backward suturing of the two halves of the bisected sac

1 *Seton or Open Packing* Volkmann's Operation The earliest use of the packing method contemplated or always caused suppuration as it preceded the antiseptic era Later when aseptic methods prevailed it was found that sterilized gauze packing would bring about the same result in adhesive inflammation between testicle and sac wall without micro organisms This to be effective must go to the extent of causing somewhat intense irritation of the serosa and swelling of the scrotum disabling the patient for rarely less than two or three weeks The thickened parietal and visceral layers while in process of obliteration cause enough reaction to be somewhat painful and to require recumbent treatment The method nevertheless is a very reliable one

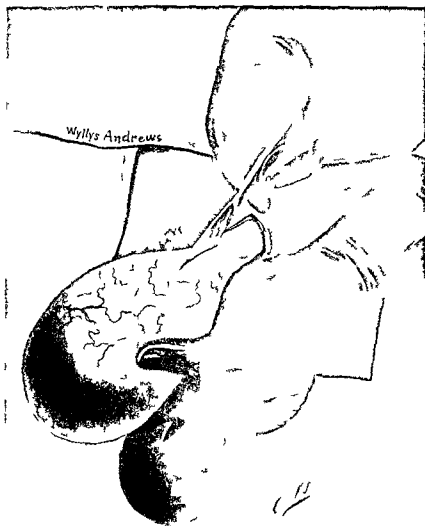
2 *Excision of Sac Wall*—It requires less severe reaction—theoretically none at all—to cause plastic union between one serous surface and the dartos or connective tissue hence if the outer layer of the hydrocele sac be excised and the visceral or that covering the testis remain an excellent cure is obtained quickly This led me and no doubt many operators independently to practice cutting off the two leaves or halves of the bisected sac so that we have reports of numerous excision operations usually attended with success

Practically, excision of the sac is too bloody to be called a neat and rapid method. The bisecting cut along the anterior median line is bloodless, but the lateral cuts, dividing the halves of the serous sac from their junction with the epididymis, cross rarely less than half a dozen vessels, requiring separate ligatures. This, with the staining of the tissues it involves, takes away all the neatness and speed of the operation. The results of this method are satisfactory, if great pains are taken not to leave any fringes of loose sac wall large enough to form new pouches. Hydroceles sometimes recur in a mysterious way from this error, and also from overlooking funicular pouches above the testicle.

3 *Eversion of Sac*—When Jaboulay's method (sometimes also called Winkelmann's method in Germany) was published, my attention was very favorably called to it, and I have never had anything but encouraging results from its employment, barring one case of recurrence which I cannot explain. I have heard uniformly good reports of it in the hands of Dr Ferguson and others here. Dr McArthur alone criticised it as causing too much reaction, swelling and pain. My own cases have showed less soreness and shorter confinement than with any other technique.

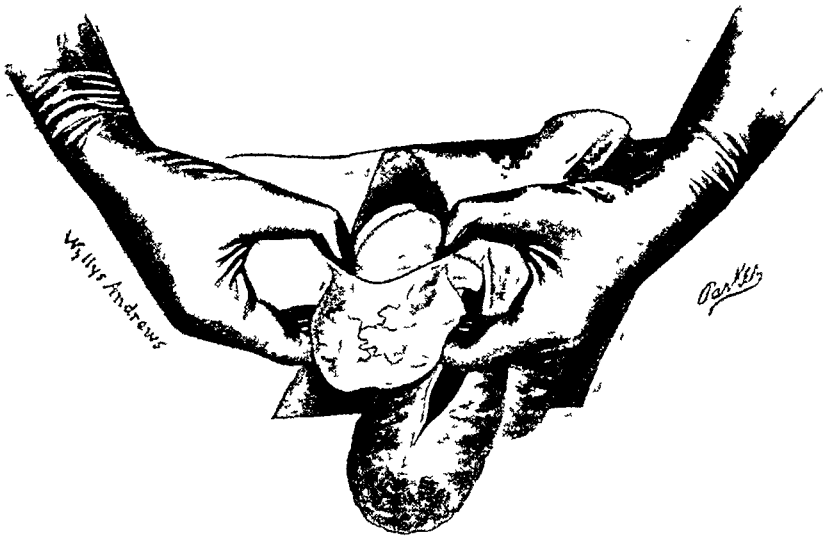
The method consists in first bisecting the sac by a vertical incision along its anterior convex surface after isolating the whole mass from the dartos and lifting it outside the scrotal skin. The two flaps or halves thus formed are then everted and brought together back to back behind the globus major and epididymis, so that the whole serous lining faces outward. Anyone not a novice can make this entire dissection so nearly bloodless that the tissues do not become sodden or stained. The two everted flaps are now sutured together behind and all possibility of their reuniting into a closed sac is as effectually prevented as if they had been excised.

4 *Author's Method*—A new technique which I have used exclusively in the past two and a half years seems to me such an improvement in certainty and speed that I recommend it without reserve, and do not hesitate to urge that it supersede

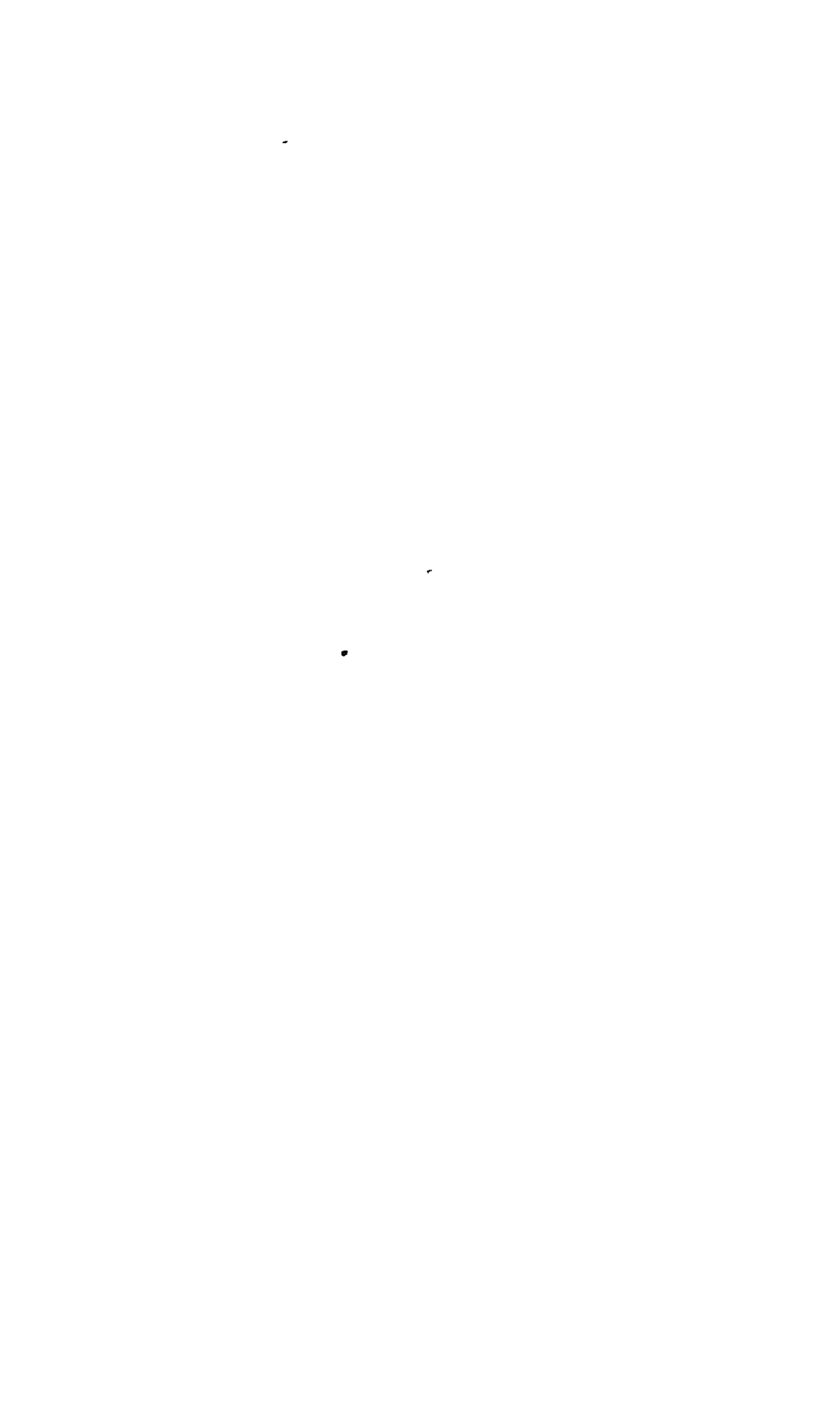


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FIG 2



Everson of 'bottle' by pushing testis through small hole in upper end



the older operations The method which I think is described very aptly by the term bottle operation brings about a complete eversion of the whole lining without the use of stitches and with much less cutting than the Jaboulay method

TECHNIQUE OF THE BOTTLE OPERATION

An anterior scrotal incision is made as in the older methods The skin should be held tense and the dissection should be nice to the exact layer which will enucleate the translucent bladder like mass from its bed (Fig 1) It is not an operation for a man over forty five to attempt without glasses

Careful study of the funicular part of the sac is now to be made Usually a little funnel continues one or two cm up the cord The extreme upper end of this marks the beginning of the cut made into the sac This cut is vertical on the anterior border and only about 2 cm long (Fig 1) We enlarge it a little by stretching Sometimes it is wholly confined to the part over the cord The incision in the sac is prolonged to its extreme upper end along the cord if the first cut did not do this When the sac has been emptied it is like a bottle or bag with a small hole at the top Dilating this slightly with one or two fingers the orifice is held open and the testis is pushed up into it with the other hand or the two thumbs (Fig 2) In a moment it can be squeezed through and the whole sac will instantly be everted with the small buttonhole so closely surrounding the cord that it is scarcely visible (Fig 3) The quickness with which this can be done will surprise anyone used to the older methods It will also be seen at a glance that there is no possibility of the testis returning into the hydrocele cavity any more than with the suture method The short incision contracts so as to fit around the cord and the whole sac by its elasticity seems to collapse around the epididymis with its white serous surface almost as smooth as that of the testis I have never seen the everted sac voluminous enough to lie in wrinkles or folds but no harm would result if it were so to act Ordinarily the largest hydrocele sacs when collapsed assume about the size of the testis showing that

their walls remain perfectly elastic. As yet I have not tried my method on any very opaque, hypertrophied or thick-walled hydrocele. It is conceivable that some such old cases resulting from inflammations, injections or former operations, might be difficult to enucleate from the scrotum, or to evert after bringing outside the skin.

The skin is quickly closed with clips or light suture, without drainage. Such wounds heal within a week. The patients get about readily on the third or fourth day, sometimes earlier. The amount of swelling about the testis is usually small, even in double hydroceles. Tenderness and pain are moderate or absent, and no fever and malaise are felt after the second day.

This operation is very suitable for local anæsthesia, and therefore can be done on the aged without risk. Its results are in striking contrast with the old packing or open method, called in Germany Volkmann's method, but really of much older date. Koenig reports that the average confinement with this method was three weeks, and also that some patients were disabled fully as long by injection treatment, which also gives a very large percentage of failures.

No complications have occurred in a considerable series of these operations in our clinic, and, so far as we can learn, no recurrences. The recovery has without exception been rapid and practically painless.

BILATERAL TUBERCULOUS BURSITIS OF THE HIPS

BY E OWEN THURSTON CB BS (LOND) FRCS
OF CALCUTTA INDIA

ALTHOUGH tuberculous disease of the bursa over the trochanter major is not uncommon yet for both to be affected at the same time may be considered a rare event the size and the remarkable symmetry of the two swellings in the case recorded below are also of interest

R— aet 8 a Hindu child District 24 Perganas was admitted into the Medical College Hospital Calcutta on June 3 1904

The history obtained was that a year previous to admission he suffered severely from fever for a month or so during the course of the fever he suddenly felt pain in the left hip which later became tender and began to swell Two weeks after the onset of pain in the left hip the same series of symptoms appeared on the right side The swelling increased but the pain and tenderness diminished at the onset of the pain some difficulty was noticed in moving the thighs but this rapidly disappeared

The swelling on either side gradually increased and for a month or so before admission there was a return of the fever but at this time much less severe in type and characterized by a nocturnal rise On admission the boy was sparely built emaciated and anæmic Both the hips were seen to be much enlarged and the swellings were to all intents and purposes symmetrical being somewhat pyriform in shape Behind the tumor was smooth and globular and extended from the iliac crest above to the gluteal fold below on the inner side it did not reach beyond the ilio-sacral articulation

In front the swelling passed downward from the outer half of Poupart's ligament the inner border being external to the femoral vessels and slanting outwards towards the insertion

of the gluteus maximus. On the anterior aspect the surface was more irregular, producing in places a bossy appearance. On the right side at the lowest point in front the skin was adherent over an area about the size of a half penny and here a hard nodule could be felt, elsewhere on both sides the skin was unaffected.

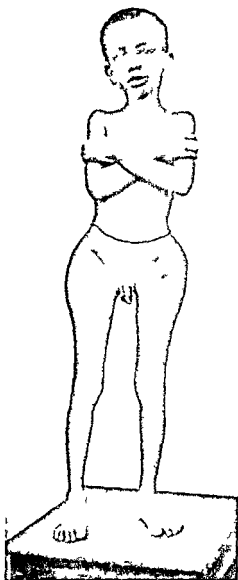
The swellings were tense and fluctuation could be readily obtained in any direction, the fluid was beneath the gluteus maximus.

Movements of the hips were free and painless in all directions except in extreme flexion when there was some limitation due to the size of the swelling. The gait was waddling and a little lordosis was present. The greatest circumference of the swellings was equal and measured $19\frac{1}{2}$ inches. A slight evening rise of temperature to 100° was present, and the patient was suffering from scabies. After a few days treatment with quinine and iron, operation was performed on the right side. A transverse incision was made extending inwards from the top of the great trochanter for about 4 inches, down to the gluteus maximus and this muscle was separated in the direction of its fibres, a large quantity of pus escaped with some masses of caseous material and many calcareous particles, the general effect being as if a quantity of mortar had been let out. Another smaller incision about $1\frac{1}{2}$ inches long was made below the anterior superior spine, through these incisions the cavity was thoroughly scraped with a sharp spoon and Barker's flushing curette, the irrigating fluid used being hot 1 in 5000 HgCl_2 . The incisions were closed with silkworm gut sutures, a small gauze drain being left in the posterior one. The wound healed by first intention and the general condition improved, there being no further rise of temperature.

Seventeen days later a similar operation was performed on the left side except that the posterior incision was made parallel to the fibres of the gluteus maximus and a third incision behind at the level of the crest of the ileum. The contents of the cavity were also similar.

In both cases the cavity was loculated and irregular, the

F



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disease having extended a little way between the deeper muscles of the buttock. A careful examination of the great trochanters was made but no bone disease was discovered.

The further progress of the case was uneventful the wounds healed by first intention and he left the hospital on July 13. The greatest circumference of the hips then being right 16 inches left 15 inches.

The photograph (Fig 1) shows well the condition of affairs before operation. He returned to hospital in September with a small residual abscess on the right side which was treated in the same way there was no further evidence of disease on the left side.

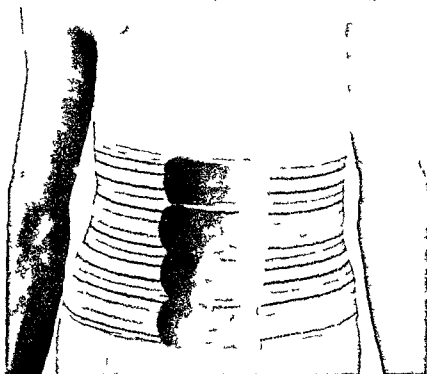
THE "SUSPENDER" ABDOMINAL BANDAGE. THE FOUR-TAILED GENITAL BANDAGE

BY G SHEARMAN PETERKIN, M D,
OF SEATTLE, WASHINGTON

FIGS 1 and 2 represent a bandage that may be employed after an abdominal operation to support the parietes. It is especially adapted to men who have to perform hard, manual labor, is economical, being made from two pair of Shirley suspenders, used by lumbermen (Fig 3). These are ripped apart, their long borders approximated, and sewed together, the four ends where the buckles are attached being left free, so that they may be tightened or relaxed, that the binder may fit individuals of different sizes, or the same individual at different times. Moreover, it necessitates neither understraps or shoulder straps, as it does not slip up or down, because the lower border of the belt being placed below the anterior superior spines of the ilia embraces the crests and, the lower buckle being drawn more tightly than the remaining three (on the principle of adjusting a corset), the elasticity of the material maintains the belt in position.

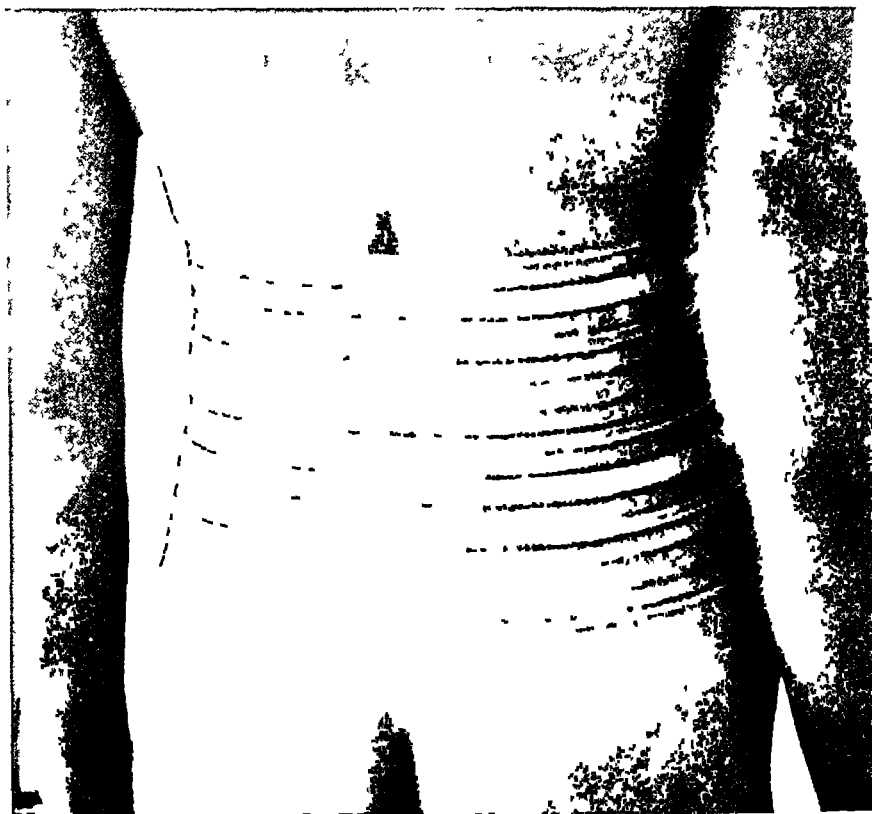
Figs 4 and 5 represent a bandage devised and employed in inflammatory conditions of, or operations on or about the scrotum and testes. Its greatest recommendation is that it is easily made, simple and effective and requires no stitches or pins, as the illustration will readily demonstrate. The material is unbleached muslin. Directions for making are as follows. Length obtained by measuring from anterior superior spine of the ilium to the end of the external malleolus, breadth, one-half circumference of abdomen. After obtaining measurements, fold material once its greatest length, nick slightly at one end the folded border, thus dividing the material in two equal parts. While it is still folded, nick the two folded halves at the same end, so as to divide them in two equal portions,

F



Th p d bd m lb d g ppl d A w

FIG 2



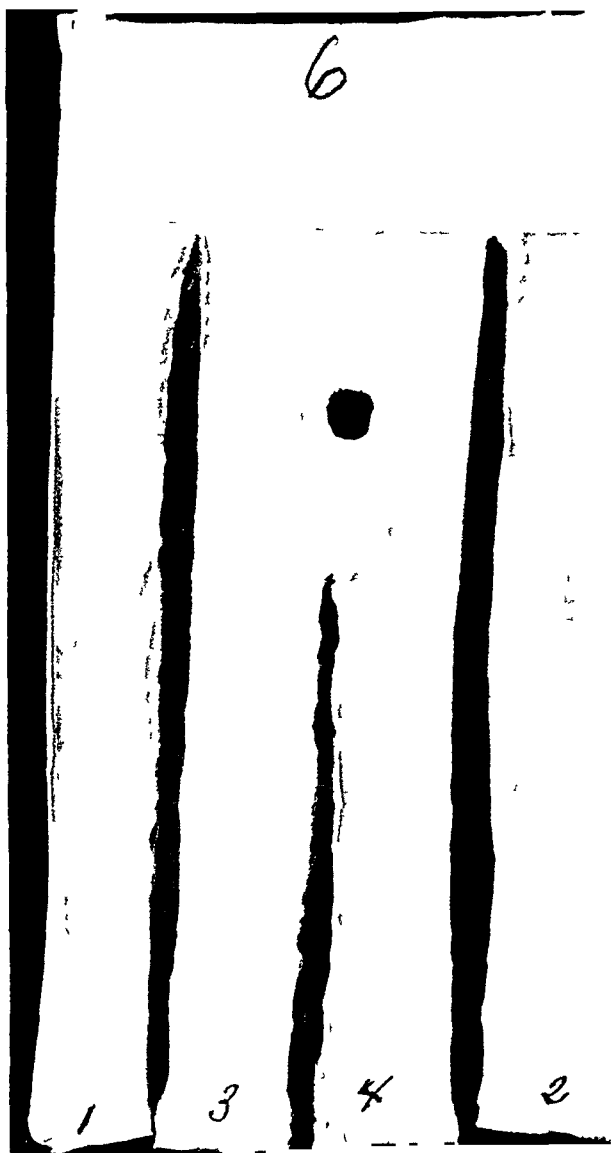
The suspender abdominal bandage applied Posterior view

Fig 3

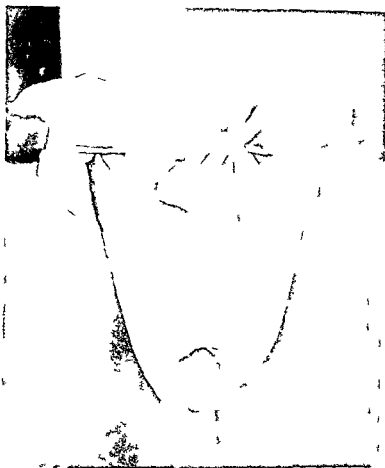


Th mm 1 pe d

FIG. 4

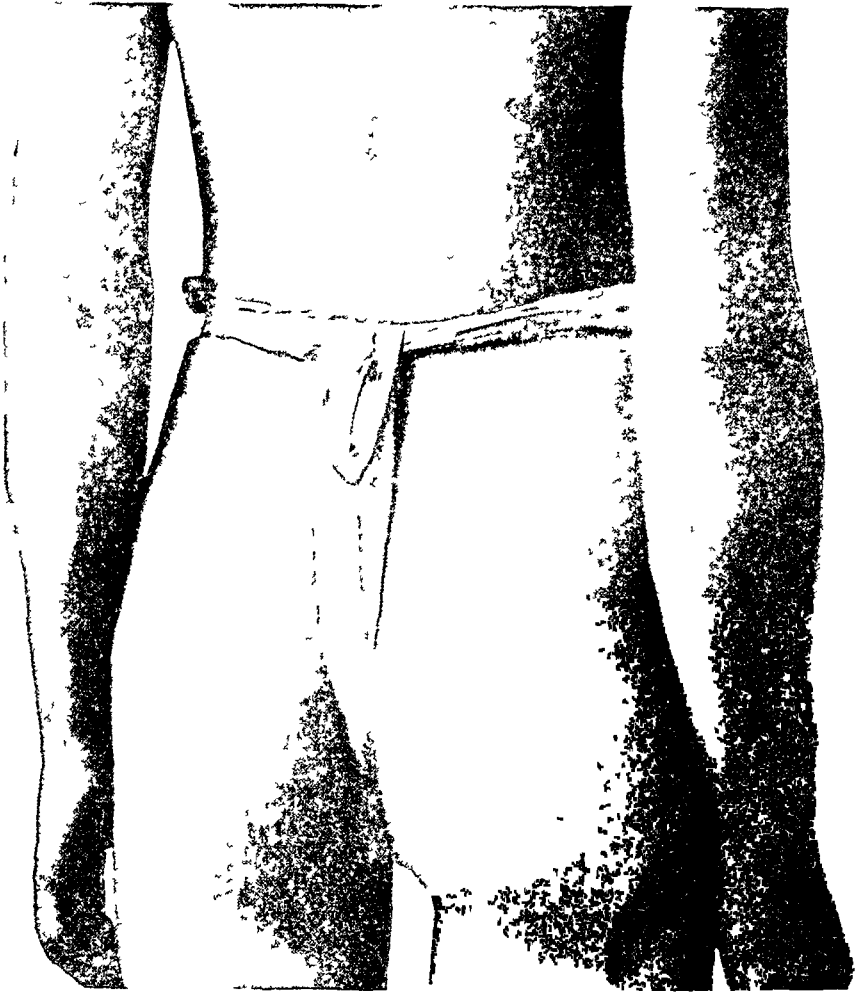


The 4 tailed genital bandage



The old and the new

FIG 6



The 4 ruled genital bandage applied Rear view

making the material when unfolded a four tailed bandage whose tails are of equal breadth. Now tear the two outer strips 1 and 2 as shown in the illustration to within four inches of the outer end. Wind these about the waist from before backward so that they will cross at the spine then tie in front (Fig 5). Slit middle portion after bandage is applied so that the end of the tear will reach just behind the scrotum. While holding the bandage in position place a fold of cotton back of the scrotum so bandage will not chafe and will push testes forward. Also apply whatever other dressings may be necessary. Next draw the two tails 3 and 4 so as to overlap and form a pocket that will hold the testes snugly and then pass between the legs over the perineum and tie at back or pin as shown in Fig 6 the pin being placed at the small of the back.

SURGICAL PROGRESS.*

GENERAL SURGERY, PATHOLOGY AND THERAPY

I Balsam of Peru as a Therapeutic Agent in the Treatment of Wounds.

SUTER, of Innsbruck, said During the past two years we have introduced, in the surgical clinic at Innsbruck (Prof Schloffer), the use of Balsam of Peru in the treatment of all recent open accidental wounds, in 562 cases in all Among these were many injuries of the most severe nature, such as severe complicated fractures with extensive injury to both bones and soft parts Concerning especially the complicated fractures of the long bones, which will probably be of the most interest, we present over 20 purely conservatively handled cases, omitting traumatic amputations, 1 case of primary amputation, and 2 cases which died shortly after the injury Of these cases, 14 healed without complications and in only 6 was a secondary operation necessary on account of pus formation, for the most part without temperature elevation Severe disturbances in the healing of the wounds did not occur in any case, in spite of the fact that there were some very severe compound fractures In no case was secondary amputation necessary and we could always retain useful extremities

The same favorable results were obtained in the treatment of extensive contused wounds of the soft parts, in crushed hands and fingers and in all lacerated wounds of the most varied nature In all of these conditions, healing could be obtained without severe inflammatory processes, even though the wounds were badly lacerated, if the cases only came under our treatment within the first two days It is important that the Balsam of

* Excerpts from the TRANSACTIONS OF THE GERMAN CONGRESS OF SURGERY, held in April, 1907 Translated by RALPH M BEACH, M D, of Brooklyn, N Y From the abstracts published in the Beilage zum Zentralblatt für Chirurgie, No 31, 1907

Peru be brought as evenly as possible into all the cavities and spaces of the wound

Concerning the question as to how the action of the Balsam in accidental wounds is to be explained I have caused exhaustive experiments to be made and have come to the conclusion that there are three entirely distinct properties of the drug

1 The ability of the Balsam to mechanically inclose bacteria and in this way to eliminate the same as far as the organism is concerned The defensive agents of the body have of course a better chance of acting successfully the less poisonous material there is present

2 Furthermore the bactericidal properties of the Balsam play an important role Even though they may be slight such properties are undoubtedly present as numerous experiments have shown This slight bactericidal power is of great importance however taken in conjunction with the ability of the Balsam to inclose bacteria as it gives opportunity for a longer continued action upon the same The exclusion of the bacteria which was at first purely mechanical becomes absolute after a time inasmuch as they are killed It is worthy of note that the Balsam of Peru acts not only as a bactericide but also gives up into the vicinity bactericidal substances which fact I could also prove by experiments Since the drug in contrast with soluble substances remains for a comparatively long time undissolved in the wound it thus forms as it were a reservoir of anti bacterial substances

3 Finally Balsam of Peru possesses to the highest degree positive chemotactic powers In the neighborhood of a drop of the drug which has been injected into the tissues is formed a peculiar wall of leucocytes When one now realizes that not only is the process of phagocytosis caused chiefly by the leucocytes but that the latter in all probability stand in intimate relationship with the formation of those bactericidal substances of the body fluids e.g. the alexins it appears justifiable to ascribe a certain favorable action in the process of wound healing to this enormous accumulation of leucocytes caused by the Balsam

In addition to these three main properties of the Balsam of Peru namely—the inclosing powers—the bactericidal powers and the chemotaxis should be noted also the antagonistic action of the drug in preventing putrefaction in the dead tissues

This latter power stands, of course, in intimate relationship with the properties described under 1 and 2

As is well known, many varied reports, concerning the untoward action of the Balsam on the urinary apparatus, have been circulated. These concerned almost without exception cases of scabies treated by inunctions of the drug. We have made exact urinalyses in a great number of cases and have never found albumin present. In no case have we observed any disturbance in the general condition of the patient which could be attributed to renal irritation. Nevertheless special attention must be given to this question.

According to our opinion, the Balsam of Peru treatment, if applied in suitable cases, such as contused and lacerated wounds, gives better results than all other methods.

Through the results of our experimental investigations, the Balsam of Peru method of treatment has been placed to a certain extent, upon a scientific basis, so that its use can no longer be considered quackery. In all of our numerous cases, we have never noted renal irritation due to the Balsam. When such cases are reported it is very possible that the Balsam used was not perfectly pure. There are aromatic bodies, which even in slight traces, can irritate the kidneys. As is well known, the drug is often adulterated and the first requisite is to use only the purest Balsam.

BORCHARD (Posen) remarked that he could, in general, corroborate the favorable results in wound healing, from the use of Balsam of Peru, but that contrary to Suter, he had noted even after the use of relatively small amounts of the drug (3-4 grammes) albumin and casts in the urine, which disappeared after immediate suspension of the Balsam. The preparations used had been obtained from two different drug firms, and varied in their chemical composition only very slightly from the formula of the German Pharmacopœia. Continual careful urinalysis is therefore necessary in the use of the Balsam of Peru.

II Iodoform-spermaceti Mixture for Filling Bone-cavities

KOTZENBERG (Hamburg) reports concerning several cases, which have been treated in the First Surgical Division of the Eppendorf Krankenhaus according to the Mosetig-Moorhof method of filling bone cavities.

This method has up to the present time not found many adherents probably due to the fact that the first attempts were attended by numerous failures. These were due mainly to improper technic both in the use as well as in the preparation of the material used. Concerning the latter point one must necessarily follow the directions given (*Wiener klinische Wochenschrift* 1906 No 44). If one does not have at his disposal a chemist well versed in bacteriological technic then one must undertake the preparation himself for the results depend to a large extent upon the asepsis.

The bone cavities must of course be well cleaned out. In order to obtain this result one uses a set of instruments patterned after the boring instruments of the dentists. This is not absolutely necessary however as one can get along well with the ordinary chisels and curettes. The cavity is next disinfected according to the method of Phelps and the warmed iodoform spermaceti mass poured in. Here it is necessary to be careful that the mass has a temperature not over 50 °C and not under 40 °C. In the former instance the iodine is separated out whereas if the mass is too cold it does not penetrate into the finer crevice of the bone.

Eleven cases were treated according to this method. Osteomyelitis gave naturally the poorest results. Of 7 cases only 2 healed primarily while 2 others after five weeks still have fistulæ with a cloudy serous exudate. In the 3 remaining cases the covering over of the iodoform mass with periosteum could not be attained. One case gave up the treatment too soon. In the remaining 2 cases the cavity mass healed well though erysipelas developed in the one. The other case is worthy of special note because though the patient had a marked idiosyncrasy against iodoform there was absolutely no reaction.

Three cases of bone tuberculosis healed primarily. A bone cyst healed finally also per primam.

Recurrences can of course occur in the tuberculous cases and fistulæ may remain after extensive osteomyelitis.

It is however not a new operation but only a special method of caring for the wounds which when compared with our previous experiences certainly possesses the advantage of materially shortening the course of the disease though it does not after all prevent the scars which are a necessary consequence of the diseases in question.

HEAD AND NECK

I Traumatic Aneurism of the Carotis Interna Cerebralis
with Exophthalmus Pulsans

BECKER (Koblenz) reported an instance of this very rare phenomenon in gunshot wounds of the skull in the case of a soldier. While he was discharging a gun, the barrel burst and some of the pieces of steel penetrated the brain. In the few cases (10), which up to the present time have been recognized, the seat of injury was diagnosed alone by the external symptoms of the pulsating exophthalmus. The diagnosis in our case, however, was made with absolute certainty by means of Röntgen photographs. The case will possibly possess, on this account, a certain interest. The patient was brought, in an unconscious condition, into the hospital, with four large wounds on the right side of the face, one passing through the nose and a second causing complete destruction of the right eye, which had to be enucleated. The left eye, the pupil of which was widely dilated from the beginning, developed at the end of ten days a protrusion and chemosis. The power of sight was so reduced that fingers could be counted only at a distance of 1 m. Marked restlessness with powerful gesticulations alternated with stupor during the first fourteen days after the injury. The protrusion of the left eye increased steadily and the mobility of the same decreased until at the end of three weeks the eye was immobile. The chemosis increased, the pulsation was both palpable and visible, and the veins of the upper lid became dilated and tortuous. Above the eye, over the left parietal region and over the entire head was audible a systolic bruit, which the patient was also conscious of, as a dull humming sound. By means of pressure one could force the eye ball back into the socket, but it would immediately protrude again if the pressure were released. Pressure on the left carotid caused the murmur and the pulsations to cease. Röntgen photographs of the head taken from the side, and also from before backward revealed the presence in the brain of three sharply defined shadows caused by portions of steel. By a combination of both negatives it was shown that one piece of steel about the size of a pea lay in the white matter of the right frontal lobe in the neighborhood

of the falx. A second larger portion about 3 cm long and 8 mm thick lay on the left side in the basal ganglia with its long axis passing through the anterior portion of the nucleus caudatus from within and below diagonally upward and outward. The third portion was of the same form as the second though thinner resembling the portion of a pen which one inserts into the pen holder. This portion lay on the left side of the sella turcica extending from the anterior to the posterior processus clinoides therefore at the point where the art. carotis int. passes through the sinus cavernosus. Here the injury to the artery had taken place and led to the formation of the arteriovenous aneurism with all the consequent phenomena of congestion in the veins of the orbit dilatation of the valveless vena ophthalmica superior protrusion of the eyeball reversal of the blood current in the same and the consequent external pulsation. The treatment which consisted in cool boric acid compresses with intermittent digital compression of the carotid against the spinal column could in no way check the constant advance of the condition.

Therefore in the fifth week after the accident ligation of the left internal carotid was performed whereupon the eyeball immediately receded the pulsation ceased and the bruit was no longer audible over the head. The patient withstood the ligation well and had no complaints but during the next fourteen days a peculiar condition of somnolency overpowered him so that he had to be awakened for his meals. It was not for a couple of weeks that he became completely awake and clear. Then in spite of rest and the prevention of every form of exertion there was gradually formed again a pulsating exophthalmus. These symptoms began to make their appearance fifteen days after the ligation. For four weeks the condition varied improvement alternating with retrogression. Then however there was a marked increase in the symptoms and the exophthalmus pulsans recurred as completely as though an improvement had never taken place. Compression of the right carotid now caused the symptoms to disappear while compression on the left side had no effect.

I opposed the ligation of the right carotid in addition to that of the left firstly on account of the danger in general after such an intervention and secondly I hesitated on account of the untoward after effects which the first ligation had caused in this man whose brain was already severely injured. I therefore

sought by means of the following method of compression to cause an improvement in the symptoms

I made a cylindrical tube of pasteboard about 10 cm long which fit exactly over the circumference of the orbit. This I fixed exactly over the eye by pouring plaster of Paris about it over the forehead, cheek, and nose. Over the closed eye was placed a small boric acid compress, and into the tube I inserted a "pig's bladder," containing in its lower end 300 g of mercury. The upper end of this "bladder," which was left untied, was filled with finely cracked ice. In addition to the pressure, the cold was supposed to influence by its constricting action the dilated veins. The patient could endure this pressure from six to eight hours, intermittently, each day, without any effect on his power of vision, which was continually controlled. In addition to this, digital compression of the right carotid was performed three times daily for an hour. By means of this continued treatment, to which was added absolute rest in bed, the prevention of any congestion, etc., the condition improved so much in five weeks that the patient had only a slight exophthalmus, no pulsation, no complaints, only slight ptosis, and could count fingers at 6 m.

The procedures in the treatment were gradually shortened and the patient was allowed to leave his bed. Five months after the recurrence of the condition, the man showed, in spite of the foreign bodies in his brain, the following status: bodily and mental condition normal, slight exophthalmus, ability to open and shut eye well, slight decrease in the mobility of the eye upward and downward, side to side movements normal, very slight ptosis, slight hypermetropia, acuteness of vision 5/20. The veins at the fundus were somewhat dilated and tortuous, but the arteries were normal, and no pulsation was visible in any of the vessels.

By comparing the case with those already in the literature I am induced to give the following resume concerning the treatment. In young persons with traumatic exophthalmus pulsans, it is to be recommended not to wait long before ligation. Digital compression for fourteen days is advisable as a preliminary mode of treatment. With older individuals, however, the latter procedure should be tried for a longer period of time, and if possible not to resort to ligation. If there occurs, however, a relapse

and the symptoms can be caused to disappear by compression of the opposite carotid then it might be advisable in view of the untoward functional disturbances of the brain and sight attending double sided ligature to recommend the attempt for a longer period of time with the method of combined compression

II Concerning Ligature of the Carotis Communis

(New method for determining the consequences of the occlusion)

JORDAN (Heidelberg) said Ligature of the common carotid still remains a dangerous operation since in 25 per cent of the cases brain disturbances occur and in 10 per cent fatal softening of the brain. The prognosis is on that account always doubtful and in the individual cases it is often left to chance whether the patient awakens at all after the narcosis whether he develops a hemiplegia or perhaps dies of a progressive softening of the brain.

In order to prevent such undesirable surprises the author recommends a new procedure which proved itself of value in animal experiments as well as in an operation for carcinoma of the neck namely previous loose constriction of the carotid for forty eight hours. By carefully constricting the artery by means of a small tape or catgut just until the peripheral pulse ceases there is no injury to the intima and no clot formation. If one removes the ligature after two days the peripheral pulse reappears and soon attains the normal strength.

This preliminary ligation must be performed under local anæsthesia since the cerebral symptoms may occur immediately after the narcosis and the determination of the onset be interfered with. If disturbances occur after the constriction one can immediately remove the ligature from the wound which has been left open and the circulation restored to normal. By gradually increasing the constriction of the ligature one can under certain circumstances cause the development of a collateral circulation which may at first have been insufficient.

Finally the method may be used as an extra security in the suture of wounds of the larger arteries.

CASE.—Fifty nine year old man with recurrent carcinoma of the right side of the neck.

Preliminary Operation—Exposure under local anæsthesia of the carotis communis below the tumor insert on under the artery of a gauze strip and the loose constriction of the vessel by means of double catgut.

No consequent symptoms, removal of ligature after forty-eight hours with immediate reappearance of the peripheral pulse. Four days after the preliminary operation, extirpation of the tumor with resection of the entire carotis communis external et internal, the N. nervus vagus, sympathetic the anterior cervical muscles and the overlying skin. No subsequent symptoms with the exception of contracted pupils and hoarseness. Normal course of wound healing. Exitus at end of three months from recurrence.

III Supra Hyoid Pharyngotomy Preliminary to the Removal of Tumors of the Nose-Pharynx

M. HOFFMAN, of Gratz. The difficulties in the removal of naso-pharyngeal tumors consist for the main part in the inaccessibility of the field of operation and in the profuse hemorrhage. There is a method, however, which allows the same general view, as the formerly used buccal and facial methods of exposure and lends itself better to hæmostasis. This consists in a transverse incision above the hyoid bone. Following the recommendation of Jeremitsch, this operation has been performed for various conditions. Von Hacker removed, according to this method a sarcoma of the base of the tongue. The view thus gained of the meso-pharynx, induced me to attempt, first on the cadaver, the removal also of tumors from the epipharynx. The important point in the use of this incision is to preserve the muscles attached to the lateral portions of the hyoid bone, in order to preserve the function of swallowing. By separating widely the walls of the opened and extremely elastic pharyngeal tube and pushing the soft palate forward, one may attain a good view of the base of the skull. This field may be materially enlarged by splitting the soft palate and the muco-periosteal covering of the hard palate in the median line, and after retracting these parts to either side removing the posterior portion of the hard palate, according to the method of Gussenbauer.

The removal, in a 27 year old woman of a sarcoma of the base of the skull by means of such a *pharyngotomia supra hyoidea transversa*, demonstrated plainly that the operation could be performed completely under control of the eye and with only slight hemorrhage. If one first controls the slight bleeding before incising the pharyngeal mucous membrane, no blood enters the pharynx as a result of the preliminary procedure. The tumor itself cannot be injured during this preliminary operation. If

the tumor bleeds more profusely during its removal than the blood collects for the main part in the epipharynx and cannot possibly be aspirated especially if a soft rubber tube has been previously introduced into the larynx for the anæsthesia. The bleeding points can now be tamponed under control of the eye and in case of more profuse hemorrhage the external cavity may be ligated by slight lateral prolongation of the incision. The cosmetic results of the operation which may also be performed under local anæsthesia are good since the scar lies in the most hidden part of the neck. The aspiration of blood during the operation can with certainty be prevented so that a tracheotomy is unnecessary. The danger of an aspiration pneumonia is certainly very slight while the mechanism of closure of the larynx as well as its reflex excitability remains unimpaired. Since the hyoid bone is left in its natural position through the preservation of its laterally attached muscles the mechanism of swallowing remains unimpaired. The normal anatomical relations are completely preserved. The patient operated upon by us could swallow well on the third day after the operation. This one favorable result does not suffice of course for an absolute judgment concerning the usefulness of the method. One has to consider the size, site and origin of the tumor in order to determine in each individual case the best mode of procedure. Still the assumption seems justifiable that the pharyngotomia supra hyoidea transversa makes possible the removal of naso-pharyngeal tumors under complete control of the sight and without the danger of profuse hemorrhage. By means of this operation the point of origin of the naso-pharyngeal fibromata *e. g.* base of the skull is well exposed. In the case of malignant tumors the operator has also the advantage that by means of slight lateral prolongation of the wound he can convince himself concerning the presence of metastasis in the upper jugular glands.

SCHLOFFER (Innsbruck) had extirpated an adenoma of the hypophysis cerebri by means of the nasal method. The diagnosis was made by the Bitemporal Hemianopsia and a Röntgen photograph. The indication for the operation was continued headache with very marked exacerbations. Although the patient had given his consent to the enucleation of an eye if this should prove necessary the removal of the orbital contents which S had at first thought advisable proved unnecessary. The expo-

sure of the hypoph cerebri through the sphenoidal veins was accomplished surprisingly easily after the entire nose had been drawn aside and the inner wall of one orbit and the antrum of Highmore removed. Between one quarter and one fifth of the enlarged cerebral appendage was left behind and the wound tamponed with Balsam gauze. There was a flow of liquor cerebro-spinalis for 14 days. No signs of meningitis three weeks after the operation. It is proven by this case that the extirpation of tumors of the hypophysis cerebri are much more easily performed through the sphenoidal sinews than one might expect, and that the much feared post-operative meningitis is not a necessary sequel.

THORAX

I Surgery of the Heart and Pericardium

L REHN, of Frankfurt A. M. 1. The presence of a cardiac injury is generally indicated by the site of the external wound, the course of the bullet or dagger and the nature of the hemorrhage. If an injury to the heart is suspected it is very important to note whether there are present symptoms of the so-called "heart tamponade" or "pressure on the heart," the latter being a term which analogous to "pressure on the brain," the author recommends to apply to that complex of symptoms due to an accumulation of blood in the pericardium. If the hemorrhage into the pericardium takes place rapidly, the pressure on the heart can lead quickly to death, whereas if it is more gradual, the pericardium can expand, accommodating itself to the increased tension. The reserve spaces of the same become filled and there are formed the so-called Recessus pericardii, by means of stretching and greater prominence of the pericardial reduplications at the points of origin and exit of the blood vessels. Below and to the left there is formed a large recess, to the right side a smaller one and above the so-called "space of the dome." These recesses and their ability to dilate were demonstrated on an instruction anatomical preparation. The heart becomes gradually "strangled" through compression of the auricles and the venæ cavæ and it becomes exhausted under the increasing pressure. This exhaustion is due to a large extent to an improvement of the nutrition of the heart on account of the insufficient filling of the arteriæ coronariæ, and also an obstruction of the

exit of blood through the vena magna cordis. If no incision is made the heart eventually ceases to beat. Pressure on the heart causes characteristic subjective symptoms. It is important to note carefully any increase in the area of cardiac dulness. In an early stage the Rontgen apparatus often shows an enlargement which cannot yet be made out by percussion. The presence of cardiac murmurs which may be varied in nature is important in the diagnosis of cardiac wounds.

2 Concerning the question of operation interference in cases of cardiac wounds spontaneous recovery does occur in a certain percentage of cases. However a person with a sutured heart is undoubtedly in a better condition than one in which spontaneous healing has taken place. It is of course clear that immediate operation is indicated where there are threatening symptoms of cardiac pressure or severe internal hemorrhage. Foreign bodies such as daggers etc. which remain sticking in the heart are to be removed only when the heart has been sufficiently exposed.

3 Exposure of the heart. The numerous methods by means of bone flaps are too heroic and accompanied by danger of infection. A conservative mode of procedure is to be recommended first making an intercostal incision externally from the border of the sternum and corresponding to the external wound. If necessary one or more ribs must be resected. If the heart is not yet sufficiently accessible a second incision perpendicular to the first must be made along the border of the sternum. After cutting through the costal cartilages the osteo cutaneous flaps above and below are to be forcibly retracted and it may be necessary also to chip away a portion of the sternum. The survey thus gained is very good. One shall attempt if possible to avoid the pleura or at least to prevent any gross injury to the same. A preservation of the pleura is generally impossible since the latter is generally opened by the initial injury. If possible the operation is to be performed with the Brauer apparatus or in the Sauerbruch chamber. An exploratory pericardiotomy is under certain circumstances indicated where the diagnosis is not certain. In this instance the author recommends a particular method: an incision along the lower border of the seventh rib on the left side toward the base of the ensiform cutting through the seventh costal cartilage gradual advance upward under the sternum to that portion of the pericardium which is uncovered by pleura.

The sac is now easily opened and if necessary drained since tubes may be easily introduced into the same from either side. Starting with this wound, the necessary incisions for exposure of the heart may be immediately made.

4 Various methods have been used to control the often profuse hemorrhage during the suture of the heart such as tamponing the wound with the finger, compression of the entire organ, drawing on the heart toward the external wound, bending the heart over the border of the sternum. The author recommends compression between the fingers of the *venæ cavæ* at their point of discharge into the right auricle, in order to thus operate with a minimum loss of blood. He had convinced himself by means of experiments on dogs that this method was practicable and could be borne for a short time without injury to the heart. The suture of the heart is best performed with interrupted silk sutures.

5 The extensive statistics include 124 cases of suture of the heart with 40 per cent recoveries. The points noted are the nature of the injury, the site of same on the heart, the cases operated upon "extra-pleurally," form of drainage with results, the complications in the successful cases, causes of death in the fatal cases (44 per cent hemorrhage, collapse, 40 per cent infection).

Concerning the question of drainage, the author recommends primary closure of the pleura, but drainage of the pericardium with rubber tubes. In addition to this, the author had collected from the various operators and reported statistics concerning the ultimate results on the operated cases.

Extract from the clinical history of a second case of cardiac suture, which the author performed in November, 1906. It was a case of very extensive stab-wound of the right ventricle. Exitus $1\frac{1}{2}$ days after operation.

ABDOMEN

I New Contributions Concerning Resection of the Liver

DR AUSCHUTZ (Breslau). The material observed (20 cases from the clinics at Rostock, Königsberg and Breslau) showed that one could, in a very simple manner, attain good results in

the resection of even large portions of liver tissue. It is decried that complicated methods or unusual appliances are necessary in resection of the liver. (In all cases single intraperitoneal operation, no foreign bodies left in the abdominal cavity). Only one case died as a result of the operation and that was due to either iodoform or chloroform poisoning. In the resection of liver tissue the important question is the ligation of the branches of the portal vein and of the artery. That this is possible is proven by the experiments of Kusnetzoff and Penski.

In resections one can simplify the ligation of these vessels in two ways. 1. By making a clean smooth incision through the liver tissue. The bleeding vessels on this smooth surface can be grasped with clamps and ligated. If one separates the liver tissue bluntly then the vessels after the extreme stretching tear and retract they can then be grasped only with difficulty and uncertainty. In case of the smooth incision however they can be easily found. The liver wound should if possible be made in the form of a wedge and closed by means of sutures.

2. The second method of procedure consists in the application of ligatures en masse as suggested by Kusnetzoff and Penski. One does not need however a particular guiding suture or special instruments but can get along just as well with the Deschamps needle. The ligature should be slowly but firmly tied.

In suitable cases one can make use temporarily of an elastic ligature. In the great majority of cases one can close the peritoneal cavity without any tamponade. Liver resection is often facilitated by cutting through the ligaments of that organ. In all cases where portions of the dome of the liver which are accessible only with difficulty are to be operated upon it is recommended not to hesitate to resect the border of the ribs on the right side and the ligamentum suspensorium.

The transpleural method should be abandoned in all intraperitoneal affections. In cases of liver injuries, subphrenic abscess etc. the resection of the free border of the ribs should be substituted in its place.

WULLSTEIN (Halle A. S.) had also during the past year made a long series of experiments on the cadaver with the intention by means of temporary resection of the free border of the ribs on one or both sides to expose the surface of the liver and the stomach as well as those lymph glands lying in the region between

the stomach and diaphragm, in front of and to either side of the spinal column. W can also substantiate the assertion of Auschutz, that the danger of opening the pleural sac from the anterior wall of the thorax is not to be feared as long as one remains in the buvean, that is below the seventh intercostal space. Nevertheless it is well to dissect away the resected ribs posteriorly from the insertion of the diaphragm close to the perichondral tissue.

RIEDEL (Jena) had sad experiences with infection of the border of the ribs. After infection of the wound surface there occurs a progressive inflammation of the border of the ribs, whereby the cartilage becomes bathed in pus. In this respect there is a great difference between the costal cartilage and the ribs. The sub-serous excision of the gallbladder is only feasible in the uninfected cases. It is important to ligate separately and surely the *art. vesicæ fellæ*. Not until then does the cysticus become free and can be ligated.

MALE GENITO-URINARY ORGANS

I Extirpation of the Prostate

H KUMMEL (Hamburg) emphasizes the fact that good functional results may be obtained by means of the Bottini operation, also by castration concerning which K himself had collected numerous statistics, furthermore by means of ligation of the *art. iliaca interna* and resection of the *vasa deferentia*. Nevertheless, the results are for the most part not to be considered as permanent, and since the author considers that hypertrophy of the prostate should be recognized as an independent local condition in itself, as a tumor, which, like all tumors, must be removed, he therefore considers the intra-capsular prostatectomy as the best therapeutic procedure in these cases, the one which, even though it is the most heroic, guarantees the best results. He, of course, recommends even more emphatically the complete removal of the prostate in carcinoma of that organ. For the diagnosis, he recommends, in all cases, in addition to the usual methods of examination, the use of the cystoscope, which gives an exact insight into the gross anatomical picture.

As contraindications to the operation should be mentioned marked disturbance in the general condition of the patient, marked

arterio sclerosis chronic use of the catheter diffuse bronchitis complete loss of vesical contractility and a renal insufficiency which does not respond to treatment With regard to the latter he recommends under all conditions cryoscopy of the blood a method which had never failed him when properly carried out

Concerning the two usual methods of operation the perineal and the suprapubic both of which show the same rate of mortality K. prefers the latter method since it guarantees a better view of the operative field an easier removal of any complications which may develop and the easier prevention of any fistula formation Technically also it presents fewer difficulties K. sees in the supra pubic operation an important disadvantage in the fact that the patient cannot be allowed to get out of bed so early Nevertheless he recommends the perineal route in all cases where the enlargement of the organ is for the main part toward the rectum and where an operation is necessary in very stout individuals

Among 41 prostatectomies which he had performed the diagnosis of carcinoma was made in 9 cases Of these 3 died shortly after the operation (apoplexy cardiac weakness carcinoma of the intestine with metastasis) 2 after three and four months respectively The remaining patients were living at the end of a year and could urinate spontaneously without any complaints In the 32 cases of hypertrophy of the prostate the perineal route was chosen in 11 and the supra pubic in the remaining cases Eight of these patients whose ages ranged from 63 to 90 years died soon after the operation and three later from intercurrent diseases A rectal fistula developed in one case as a result of the operation This patient died of bronchitis and cardiac weakness some time after a secondary operation for closure of the fistula A second patient complained of disturbance in the sexual functions a third of painful priapism In all of the remaining cases the results of the operation were most satisfactory the bladder functions were entirely normal and the urine could be passed in a stream The capacity of the bladder was such that the patients had to urinate only every 3 to 6 hours in the daytime and at night only once or perhaps not at all Three patients complained that they could not urinate as well as shortly after the operation It developed in these cases that strictures were present in the pars membranacea after the removal

of which the symptoms disappeared K considers it, therefore, most important to pass sounds after some time (after about one half year) on all operated cases, in order to prevent stricture formation

He had, for some time, performed the operation under spinal anæsthesia using tropo-kokain and adrenalin He had formerly used the scopotamine—morphine—æther narcosis In the use of the lumbar anæsthesia K sees a distinct advance in the performance of prostatectomy, which is not to be underestimated, especially since general anæsthesia has to be dispensed with in many elderly patients, on account of the heart and lungs K makes the following resumé of his views concerning extirpation of the prostate

1 In the cases of chronic, complete, and incomplete retention of urine, the permanent catheter is first to be tried, if there are no complications and catheterization can be easily performed If this treatment is not successful and the patient is still compelled to empty the bladder by means of the catheter, then the operation is to be recommended

2 The extirpation of the prostate is the most heroic method of operation and accompanied with the most dangers Still with a favorable course, it promises a sure and permanent result

3 In the choice of the mode of operation, perineal or supra-pubic, one must be guided by the individual case Where the hypertrophied organ projects deeply toward the rectum and but slightly toward the bladder, as well as in patients where the abdominal walls are well developed and fat, one should choose the perineal route If the prostate projects more toward the bladder, than the trans-vesical method in general, one should give the preference to the supra-pubic method since the technic is easier, the length of time of healing shorter, the after-treatment simpler, and the danger of incontinence and fistula-formation is less

4 The actual danger of the operation appears to be about the same in either method

5 The contraindications to prostatectomy are marked disturbance in the general condition of the patient, extensive arteriosclerosis and diffuse bronchitis, renal insufficiency, which does not respond to treatment, and complete loss of vesical contractility

6 Radical operation is always indicated if carcinoma is suspected

SCHLESINGER (Berlin) reported the results at the Jewish Krankenhaus (Prof Israel) nineteen prostatectomies—operative mortality=3 (one case from pulmonary embolism a second from coma diabeticum the third from a post operative anuria cause not determined) One death five months after operation from pyelitis Subsequent course not followed in two cases One incomplete result in a case of partial prostatectomy Perfect result in 12 cases Author recommends caution in the indication for operation on account of the relatively high mortality though cause of death cannot be ascribed to imperfection in technic

Almost all operations under lumbar anæsthesia

Supra pubic method preferred

- 1 Because it is more easily and quickly performed
- 2 Because the median lobe can often only with difficulty be removed by the perineal route
- 3 Calculi may be easily overlooked in the perineal operation

Care of the wound

- 1 Bladder completely sutured (danger of post operation hemorrhage almost nil)
- 2 Tamponade of cavity left by removal of gland Catheter in urethra (usual method)
- 3 Drainage from above and counter opening (only in cases of severe infection)

Fact that incontinence does not result post operationem is ascribed by Schlesinger to the vicarious assumption of this function by the sphincter externus

VOELCKER (Heidelberg) The experiences at the surgical clinic at Heidelberg comprise 32 cases of perineal prostatectomy during the past six years The results are as follows three patients died directly after the operation one of collapse after chloroform narcosis the now generally accepted lumbar anæsthesia appears to be less dangerous A second patient died as the result of an injury to the rectum with ascending infection of the urinary apparatus Injury to the rectum occurs generally at the point where the pars membranacea urethræ is bound by muscular bundles to the rectum and where sharp dissection with the knife is necessary to separate these structures At this point

it is necessary to use great caution and to control the procedure by means of a finger in the rectum. A third patient died of a diffuse purulent peritonitis. Although at the autopsy one could not make out any injury to the peritoneum, it was probable that the peritoneal prolongations over the seminal vesicles had been opened, an accident which can probably be prevented by a more exact attention to the anatomical details.

Two of the patients died after their discharge from the hospital, one from infection of the urinary apparatus, he had a cloaca as a result of injury to the rectum, a second committed suicide at home, 31 days after the operation. This act was probably induced as the result of a confused mental condition of the patient due to uræmia, or was due perhaps to doubt on his part, on account of an incomplete recovery from his painful disease.

With regard to the danger of the operation, may be mentioned the fact that these patients are often very critically ill for the first few days after the operation. Three patients especially were very critically ill, but eventually recovered. The careful supervision of an efficient perineal drainage of the bladder is very important in the prevention of urinary retention and septic infection.

In one case we attained a permanent poor result. The patient operated upon six years before, had suffered continuously from a chronic purulent cystitis, recurring attacks of epididymitis, and from para-vesical and peri-ureteral abscesses. In this case the prostate was removed as a whole with its capsule by the perineal method, and during the course of healing there was formed only an irregular urethra in the scar tissue. It was impossible, in this case, to perform the intracapsular enucleation of the gland.

In 5 cases the patients were left with moderate complaints, two suffered from perineal fistulæ. Concerning the technic of the operation may be mentioned the fact that the smaller the incision in the pars memb-urethræ, the less is the liability to fistula formation. It is better if one opens the urethra only in the pars prostatica. Two patients were left with a permanent weakness of the sphincter, although this condition was present, to be sure, before the operation, one patient suffered from chronic cystitis.

On the other hand we have attained satisfactory permanent results in 21 (65 per cent) perineal prostatectomies

Our experiences concerning the supra pubic prostatectomy are fewer since we have used this method in only 7 cases. The operation from above is undoubtedly more quickly performed, completed in many cases in fact with remarkable rapidity. Good drainage through the bladder wound above as well as through the urethra is important during the after treatment. The danger of pneumonia seems to be greater after the supra pubic operation. The perineal operation though technically more difficult is anatomically more correct and all things being equal seems to be less dangerous if performed well.

GOBELL (Kiel) reports the results which have been obtained with prostatectomy at the surgical clinic of Prof Helferich. The hypertrophied gland was removed six times by the perineal and fourteen times by the supra pubic method. Only one patient died immediately after the operation, a case operated supra pubically. The supra pubic prostatectomy according to the method of McGill Freyer is preferred as being a procedure which the patients bear for the most part well if used in combination with the Bier method of spinal anæsthesia. Fistulæ resulting from the perineal method remained open much longer than after the supra pubic operation. In two instances it was necessary to close perineal fistulæ by means of plastic operation. Subsequent treatment after the supra pubic operation must be very careful. Frequent bladder irrigations through the catheter and two drains introduced through the wound in the bladder. It is to be recommended during these bladder irrigations to massage every now and then from the rectum the space left by the removal of the prostate gland. Also for the patients to sit up early and take deep breathing exercises.

Prostatectomy was performed three times on account of malignant tumors. Exitus in all cases from pyelonephritis.

REERINK (Freiburg). In many cases it is sufficient to open the urethra and remove only smaller portions of the prostate. The urethra does not only have to be opened but must be separated as much as possible in the membranous portion. The patients can get up soon after these procedures.

P. ROSENSTEIN (Berlin) reports a perineal prostatectomy with favorable result in a 76 year old apoplectic (operation under

lumbar anæsthesia 0.075 1 ropakokain) a case which seemed to him worthy of note on account of a complication with calculi. A retention of urine developed three weeks after the operation, caused by the formation throughout the entire extent of the urethra of a column of calculous material (descended from the kidneys), which had to be removed with the forceps. The perineal scar withstood well the enormous distension of the bladder due to this urinary retention. Subsequent course normal.

RYDYGIER (Lemberg) recommends early operation before catheterization fails. Supra-pubic operation preferred in enlargement of the median lobe, otherwise perineal method. R performs the intracapsular prostatectomy leaving attached to the urethra two strips of the gland about 1 cm thick. The urethra itself is not opened and all the rest of the prostate is removed. The technic is to be sure, more difficult, but, if the operation succeeds it is much less dangerous. R demonstrated his method by means of photographs. Perineal incision in the median line (only exceptionally according to the method of Zuckerhandel). One then bores in with the finger in an anterior direction alongside of the M levator ani, isolates the M recto-urethralis and divides the same. The posterior surface of the prostate is thus exposed. The capsule is now incised on one side, the prostate separated by means of the finger and rotated until one can reach the portions of the gland lying in front of the urethra. The prostate is finally excised smoothly along the urethra and it is possible in many cases to operate without injury to the same. Incontinence of urine and fistulæ cannot develop under these conditions. Hemorrhage is less in the perineal method.

DE QUERVAIN (Chaux-de-fonds) considers the supra-pubic prostatectomy as the less dangerous, based upon the results of 12 cases. The hemorrhage is generally slight. Only two fatal cases in the 12. It is important to irrigate the permanent catheter after a few hours with sterile saline solution. All healed cases can urinate spontaneously and also retain the urine.

RUMPEL (Berlin) reports the results at Von Bergmann's clinic. Preliminary cystoscopy is important to determine the mode of operation. Many prostates which surround the urethra in the form of a solid wall, cannot possibly be operated upon according to the supra-pubic method. Author warns against filling the bladder with air on account of the danger of embolism.

In the after treatment he uses the double drainage. Bladder irrigations to be given at least 5-6 times daily. The fistulæ close quickly. Psychical disturbances after prostatectomy are not rare, severe melancholia developing in numerous cases. Author had two cases of suicide.

FREUDENBERG (Berlin) presents two preparations from cases of supra pubic prostatectomy. In both cases he had performed complete enucleation of the gland, urethra generally included. In one of these cases it seemed by rectal examination as though gland tissue had developed again and there had taken place a prostate regeneration. This regeneration generally proceeds from the capsule. These patients retained their potency, although a preliminary vasectomy had been performed. F had one death in seven prostatectomies. As a general rule the urethra may be disregarded, which simplifies the wound conditions and makes the performance of the operation easier and quicker. Author does not recommend elevated trunk position.

PREINDEL (Troppan) reported two cases, in one of which there was present a balm like occlusion of the urethra due to one of the lateral lobes. In both of these cases the potentia coeundi was retained. P lost one man from a urinary retention at the end of a year after a successful Bottini operation.

ISRAEL (Berlin) thinks the indications for prostatectomy should be as narrow as possible. In a large material he had performed the operation only 19 times. The fact that a patient is compelled to use the catheter is not considered an indication. On the other hand he does not consider a flabby inactive bladder as a contraindication. He had only unfavorable results after castration. The sectio supra pubica is to be recommended on account of the ease of performance and the impossibility of injury to the neighboring organs. These injuries after the perineal operation are sometimes very great and author considers that every prostate can be removed through the supra pubic route. One can generally operate through a small incision and must depend rather upon the sense of feeling than upon the sight. One need enlarge the incision only if there is danger of tearing the bladder as when large prostatic tumors are to be removed. The presence of much adipose tissue does not contraindicate the sectio-alta rather the contrary. There is nothing to prevent the addition of a transverse incision to the original one if necessary. The

prostatic cavity should always be kept tamponed to prevent the possibility of late secondary hemorrhage, which can never be predicted

PAYR (Graz) had operated in two cases under local anæsthesia. Fifteen minutes before the operation, he injected 50 c.c. of a 1 per cent eucaine solution into the bladder and then operated under Schleich anæsthesia. The enucleation is made easier by infiltrating the deeper tissues with the Schleich solution. He had never seen any bad results from filling the bladder with air.

SCHATHEIS (Wildungen) had performed *sectio-alta* in 9 cases. Among these were two deaths on the seventh day post-operationem. There was present here a *prostata circumvallata* about the urethra. Another case died on the twenty-first day. In two cases, the result was nil, while in another there was left behind an abdominal fistula. S. does not hesitate to enucleate the gland in toto. The apparently flabby bladder is no contra-indication to the operation. One should not forget the possible occurrence of impotency. Referring to a case in which the ureters united in the hypertrophied prostate S. lays weight upon the importance of making visible the ureters before the enucleation and to this end recommends the previous subcutaneous injection of either methylene blue or indigo-carmin.

HELPERICH (Kiel) is an advocate of the supra-pubic operation. The difficult cases are those where hard tumors are present. He recommends that the operator pass his own finger into the rectum in order to press the gland forward, rather than leave this to an assistant. He had operated in a similar method as Wallstein with partial resection of the symphysis.

TH. ROVSING (Copenhagen). My views concerning prostatectomy for hypertrophied prostate are entirely different from those surgeons who treat all cases of prostate hypertrophy, or at least those complicated with chronic urinary retention (Kummel), by means of the *prostatectomia totalis*. I prefer to treat these elderly patients in a much more conservative manner, and it is only when I am absolutely compelled to, that I suggest to these generally very weakened old men such a dangerous operation as a prostatectomy.

Among my 150 operations for prostatic hypertrophy, are about 90 vasectomies without a death, and with 60 per cent cures.

I agree with Helferich that the vasectomy is a most excellent operation if it is performed early and in suitable cases (that is to say cases of diffuse soft hypertrophy). There was also not a death among 50 supra pubic cystotomies. In only 10 cases have I undertaken a partial and in 6 cases a complete prostatectomy being compelled to on account of suspected malignancy threatening hemorrhages or a form and size of the intravesical prostatic tumor which made the application of a Pezzer catheter impossible.

Prostate hypertrophy is in itself a perfectly benign disease and as a matter of fact in only 16 per cent of the cases where a urinary retention is the result can it be considered a disease demanding operative interference and the treatment should have as its object the removal of the urinary retention and its consequent dangers. If this end may be attained in the great majority of cases by such relatively harmless methods as vasectomy or cystotomy then I consider the dangerous and indeed often in successful prostatectomy as the chosen mode of procedure to be both illogical and unjustifiable and I should like also to ask why we should remove such an important organ as though it were a malignant tumor when the real indication is only to provide exit for the urine.

The results of prostatectomy which have to day been brought out have confirmed me more than ever in the opinion that my standpoint is correct. For firstly it has been shown that the operation is very dangerous to life all of the statistics showing an immediate post operation mortality of over 10 per cent—some over 20 per cent and even up to 30 per cent. We could perhaps content ourselves with this result if it were true as many of the adherents of the operation claim that the surviving patients declare themselves entirely contented with the result of the operation. Still I should like to call your attention to the enormous number of patients who are compelled to suffer from a vesico rectal fistula as a lasting remembrance of their operation to the many cases of incontinentia urinæ of perineal fistulæ further to those cases where the urinary retention continued entirely uninfluenced by the operation all of which are cases which prove that the results of prostatectomy are always very uncertain. Finally among the so called successful prostatectomies we find a large number of suicides a fact which should also give us material for earnest consideration. Rumpel asks if anyone might think of the

possible connection between prostatectomy and suicide. In this connection I should like to call attention to the fact, that for many years I have warned concerning this danger of prostatectomy, demonstrating the often incurable psychic depression, which may be caused by inflammatory destruction of the prostate due to prostatitis gonorrhoeica, tuberculosa et phlegmonosa. I am firmly convinced that there is a very intimate relation here between these cases of suicide and the prostatectomy.

If I am compelled to undertake the operation I prefer the Freyer supra-pubic method. Technically this operation is so wonderfully easy and rapid of performance that I readily understand and in this respect share the enthusiasm of the gentlemen, who have resorted to it, but the operation is just as dangerous as it is beautiful and seductive. Of four cases of prostatectomy operated according to the Freyer method, one died on the second day of cardiac asthenia, a second developed on the fourteenth day post-operationem, after the external wound was practically healed, a profuse hemorrhage from the prostatectomy wound, and death was only averted through a firm tamponade after the method of Miculicz. In two cases there developed narrow strictures which demanded the constant use of bougies, and in one case the urinary retention was in no way influenced. Of two cases of perineal prostatectomy one died on the third day and the other developed a calculous deposition in the prostatic cavity with urethral strictures.

I should like to win, if possible, all surgeons to the following compromise: in complete urinary retention to limit one's self in all cases to the cystostomia supra-pubica, with no anæsthetic, this operation is entirely without danger and relieves for the time being the urinary retention and all its consequent dangers.

Following my method of suturing immediately, the wound in the bladder firmly and closely about a Pezzer catheter, any escape of urine after the operation is absolutely impossible and the uneventful healing of the wound is thereby insured. A cystitis can be cured quickly by means of nitrate of silver treatment and the renal functions, which are always impaired and insufficient in these advanced cases, can be quickly improved, thereby also the patient's general condition. When now the patient has again regained his strength, it is time enough to discuss with him, whether he is so inconvenienced by his fistula that he would care

to undergo a prostatectomy with all its dangers and uncertain results. As a rule the patients would declare themselves perfectly satisfied and wish to retain their prostate glands. In those individual cases however where the prostate has developed so far forward into the bladder that there remains no place for a catheter and where hemorrhages and tenesmus make life unbearable then the Freyer prostatectomy can be performed through the bluntly dilated supra pubic fistula under much better conditions and as a rule without anæsthesia.

II Modifications of the Sectio Alta

DR WULLSTEIN (Halle A S) Sectio Alta is indicated especially in diseases of the prostate in vesico vaginal or recto vesical fistula and in tumors of the bladder which are situated either in the fundus or in the neighborhood of the ureters.

In this temporary total resection of the symphysis W makes a skin incision from a point one finger's breadth above the centre of Poupart's lig. on the right side in a curved direction convex downward close to the root of the penis which is drawn strongly downward to a corresponding point on the opposite side. There upon the ligamentum suspensorium is incised close to the root of the penis the inguinal canals opened by incisions in the aponeurosis of the M. obliquus externus in both sides the vasa deferentia displaced laterally. Openings are now made in the fascia transversa just above the tubercula pubica near the outer border of the recti muscles and the anterior wall of the bladder pushed back from the symphysis by means of a finger introduced through the above openings. A gigli saw is then introduced through one of the above openings passed posteriorly closely about the symphysis and the latter sawed through in a line beginning below at a point in the arcus pubis just lateral to the root of the penis and passing above through the spine of the os pubis. The same is done on the opposite side and a double pubotomy thus performed. By means of a chisel blow the arcus pubis is now separated transversely from the remaining portion of the symphysis and left intact below as a narrow bracelet of bone with the attached ligamentum arcuatum inferius and the root of the penis. The symphysis is thus totally resected and retracted upward.

This method of resection of the symphysis, fulfills all the requirements for the subsequent operation on the bladder, and takes into consideration also all the anatomical conditions present, which might possibly suffer as a result of another mode of procedure. Since, the horizontal rami remain completely intact, any lesion of the *vasa cruralia* and *obturatoria* and of the *nervus obturatorius*, is out of the question. Furthermore, since the median portion of the obturator foramen remains surrounded by a bridge of bone, the tension of the *memb obturatoria* does not suffer injury and any predisposition to hernia-formation is prevented. And, thirdly, in spite of the fact, that the *arcus pubis* is separated laterally in its continuity from the rest of the pelvis, it still remains as a rim of bone, in intimate contact with the root of the penis and *lig arcuatum* and the vessels and nerve to the dorsum of the penis, and the plexus of *santorini* are thus most carefully preserved. The erectile mechanism of this organ is thus in no way impaired.

When the operation has advanced to this point the bladder, completely emptied of urine to prevent infection, is filled very slowly and carefully with air, by means of a Nelaton catheter and a syringe. In order to prevent with certainty the occurrence of air embolism, the capacity of the bladder is accurately determined the day before by filling it with boric acid solution. Since the entire anterior wall of the bladder is exposed, the latter does not need to be filled, to the extreme, with air.

In making the incision into the bladder it is necessary to bear in mind the course of the terminal branches of the *vasa vesicalia superiora et media*. A horizontal or an oblique incision should be made, depending upon whether the tumor is located in the fundus of the bladder or in the neighborhood of one of the ureters.

An assistant then passes his finger into the rectum and pushes upward into the level of the wound that portion of the bladder, upon which shall be performed the extirpation of the tumor and the resection and suture. This is generally not difficult, since after further incision of the *ligamentum arcuatum inferius*, the root of the penis may be easily displaced anteriorly as far as necessary. It is superfluous to resect the horizontal and descending rami of the pubis further laterally from the root of the penis.

For the normal healing of the bladder wound it is desirable to keep that organ as dry as possible for two or three days. Thus

can be accomplished by means of permanent catheters in the ureters. It is best to use catheters with terminal openings and they need be passed only a short distance into the ureters. It is also advantageous to inject once or twice daily into the catheters a small amount of a 1/10-1 per cent silver nitrate solution. In addition to the ureteral catheters a Nelaton catheter should be introduced into the bladder.

That fistulae occur so often after the bladder suture (adaptation Lembert sutures) is to be explained by the anatomical conditions present. It is especially inadvisable in these bladders with thickened rigid walls to introduce a further invagination suture since the Lembert must thus necessarily become stretched loosened and insufficient. In addition the invagination suture is entirely useless since here on this extra peritoneal portion of the bladder wall we have to do with only the prevesical fat or if we dissect this away only the muscle layer in short tissues which if coapted by invagination show (in contrast to the serosa of the stomach and intestines) absolutely no tendency to a fibrinous adhesion and union. The aim here must be therefore to attain such healing of the wound surfaces as shall produce within two or three days a firm union over a given area by means of budding and branching of the blood vessels. Therefore in these cases with hypertrophic and rigid bladder walls where the predisposition to fistula formation is especially great a curved incision should be made through only the outer half of the bladder wall this outer layer then dissected back either bluntly or by sharp incisions in the form of a flap and retracted. An opening into the bladder is then made in the middle of this surface by means of a sharp straight incision. This incision in the inner layer of the bladder wall which is soft and pliable and therefore suitable for invagination may be permanently closed by suturing in two or even three layers. In this method of invagination broader surfaces are brought into contact with each additional layer of sutures and the best chances for healing are afforded. Finally the flap made from the outer layer of the bladder wall is sutured back in its original position and adds from this protection to the invagination sutures.

The symphysis is then fixed in place by means of two silver wire sutures on either side and the rim of the arcus pulvis united to the surrounding bony structures by means of silk sutures.

through the periostium. The incised lig. suspensorium is then repaired and the two slit-like openings in the fascia transversa closed. The vasa deferentia are now replaced in the inguinal canals and these closed by suturing the aponeurosis of the external oblique. There remains now only the skin incision to be closed.

III Total Extirpation of the Urinary Bladder with Double Lumbar Ureterostomy.

T ROVSING (Copenhagen). A total extirpation appears to be indicated in many cases of extensive diffuse malignant growths. While up to the present time only about 30 such operations have been performed, this is undoubtedly due to the high primary mortality (over 50 per cent.) of the procedure. This high mortality is not due so much to the actual danger of the extirpation, as to the difficulty in caring for the cut ends of the ureters, in such manner as to prevent the subsequent urinary infiltration and infection of the wound cavity.

The methods which have been used up to the present time in the care of the ureters, are for the main part the following three: 1. The ureters have been left lying free in the floor of the large wound cavity (Bardenheuer, Kummel). 2. Implanted in the rectum (Maydl) or in the flexura sigmoidea (Wilms and others). 3. Implanted in the vagina which is then closed by calpocleisis.

The great mortality and the disagreeable features attendant upon the above-mentioned methods (urinary infiltration, ascending infection of the kidneys from the rectum, etc.) have induced me to seek a new path for the exit of the urine. Since the results of my three operated cases have encouraged me to continued attempts, I allow myself to present this method for your worthy consideration. Concerning first the extirpation of the bladder, I generally perform the operation without opening that organ after the manner of enucleation of a cystic tumor, proceeding as follows. The bladder is first injected with 200 c.c. of an antiseptic fluid and the patient put in the Trendelenburg position. Good access to the bladder is gained by a curved incision, convex downward, with partial separation of the insertion of the Mm. recti. The vertex and lateral portions of the bladder are now separated

from the surrounding loose connective tissue by means of double ligation and incision of the firm vascular connections then if possible the peritoneal covering is separated carefully from the posterior wall of the bladder if however the peritoneum is adherent to the infiltrated bladder wall then the peritoneal cavity must be opened and the organ removed with its serous covering. The ureters are severed 1-2 cm from the bladder cutting between double ligatures. In female individuals it is now only necessary to separate by blunt dissection the neck of the bladder and about 1-2 cm of the urethra clamping these off with a narrow angioclamp and severing peripherally. In male patients the process is more complicated. Here the prostate and base of the bladder must be carefully separated from the rectum. The pars memb urethræ which is now exposed is drawn out in the form of a pedicle and severed after first applying a narrow hemostat peripherally. This clamp remains in place 24 hours in order to prevent hemorrhage from the cavernous tissues. It is thus possible to complete the bladder extirpation as a practically bloodless operation. If the peritoneal cavity has been opened and the serous covering removed with the bladder it is now closed by means of a transverse a Mikalicz drain which consists in spreading out a large piece of gauze in the wound and filling it with strips of the same material. The whole is brought out through the centre of the wound. I always saturate the gauze strips with a 1-2 per cent. silver nitrate solution. The rectal muscles are now sutured with aluminium bronze sutures and the skin wound closed.

After this operation which lasts from one half to three quarters of an hour short lumbar incisions are made on either side extending laterally 8-10 cm from the border of the M erector spine. Each ureter is now sought out by palpation just below the pelvis of the kidney and brought forward into the wound by hooking a finger about it. It is now separated cautiously by means of blunt dissection with the finger down to the ligated end and drawn up out of the wound. We now have both ureters hanging free from symmetrical points in the triangle of Petit each about 8 cm from the median line. The lumbar incisions are now sutured. In my first case I immediately cut off the ureter flush with the skin suturing the tunica fibrosa to the fascia and the mucosa to the skin. Funnel like retractions of the ureters took place in this case and I have therefore modified my

technic in the later cases, I do not fix the ureter at all but leave it hanging down entirely free in a glass receptacle, after inserting a No 12 rubber catheter, until its end is just past the level of the abdominal wound. Externally the ureter is drawn through a perforated rubber finger and thereby protected. The ureter now heals in the wound and the free dependent portion shrivels up and becomes necrotic to within 2-3 cm of the wound. When the lumbar wound is healed at the end of 8-14 days, the necrotic portion is excised, while the living portion projects as a small beak-like urethra above the skin level and is soon covered externally with epidermis.

From now on the catheter is not introduced, and the free passage of urine is provided for by means of a bandage, made according to my design by the firm of Svenssen and Hagen.

The bandage consists in a broad elastic girdle, in which are sewed two silver plates each with a circular opening into which fits exactly a flat silver capsule which collects the urine. Attached to this silver capsule and passing over the border of the plate is a flattened silver tube, and from this a rubber tube, through which the urine passes to a urinal below the symphysis. On the urine side of each silver plate is a circular rubber ring filled with air, which, by means of the bandage is pressed firmly against the lumbar region about the opening of the ureter. By means of this bandage worn day and night for 11 months, my first patient was able to keep absolutely dry. R demonstrated a bladder removed from a 34-year-old single woman. The entire mucous membrane was changed into villous masses, and the entire posterior bladder-wall was so infiltrated with the tumor masses that it had to be removed with its serous covering attached. For 6 months she had suffered from constant profuse hematuria and constantly increasing tenesmus, and upon admission to the clinic was most miserable, anæmic and had lost much flesh. Cystoscopy was impossible on account of the hematuria and tenesmus. After dilatation of the urethra ad modum simon, a digital exploration of the interior of the bladder was undertaken, and it was determined that the entire mucous membrane had been changed to tumor masses.

Total extirpation of the bladder with double ureterostomy performed on May 3, 1906. All three wounds healed well, but stay in bed was materially lengthened by the development of a

thrombosis in the left vena femoralis Since then the patient has improved rapidly gained 30 pounds feels well and is able to work The bandage acted to her entire satisfaction so that she remained dry day and night.

Twice since then the author has had occasion to perform the same operation upon male patients both in the university clinic

The first case is that of a 67 year old man who was operated upon September 6 1906 He had two cancerous papillomatous masses in the bladder one of which had invaded the entire region about the left ureter while the other had infiltrated the vertex and collum vesicæ in all the layers Extirpation without hemorrhage and peritoneal cavity not opened

As had been expected the left ureter was markedly dilated and the left kidney hydronephrotic the right ureter normal but the right kidney entirely atrophic a condition which had not been suspected The wound healing was normal but the patient became uræmic on the eighth day and died in coma

Cause of death determined at autopsy to be due to double renal atrophy and myocarditis It was interesting however to note that not the trace of a metastasis could be found a fact which should encourage us to renew our efforts and constantly seek a radical cure for these cases of vesical and prostatic carcinoma

The third preparation was from a 57 year old man upon whom R. had operated four weeks previously It was possible here to extirpate the bladder unopened in conjunction with the prostate and the pars prostatica urethræ fortunately for one can see from the preparation that not only is the major portion of the bladder infiltrated with an encephaloid carcinoma but the Pars prostatica urethræ shows already small tumor masses This patient also withstood the operation especially well and at the present time feels perfectly normal His kidneys act in a satisfactory manner so that a radical cure in his case depends upon whether he also is free from metastases

The advantages which my mode of operation appear to me to possess over the former methods are the following 1 A completely aseptic bladder extirpation is possible since urinary infiltration and infection from feces are impossible 2 There is thus prevented the great danger of a secondary ascending infection which is always possible when the ureters are implanted in

the rectum S. romanum or vagina 3 In female individuals this method has the advantage over the vaginal implantation of Pawlick, that the genital sphere and functions of the woman are undisturbed

Perhaps this operation may be indicated not only in malignant tumors, but also in the severer forms of ectopia vesicæ and also in ascending uro-genital tuberculosis

BOOK REVIEWS

AMERICAN PRACTICE OF SURGERY A Complete System of the Science and Art of Surgery By Representative Surgeons of the United States and Canada Editors JOSEPH D BRYANT M D LL D and ALBERT H BUCK M D Complete in Eight Volumes Profusely Illustrated Vols I and II Wm Wood and Co New York 1907

There are two ways now a days of writing a medical book single handed or in a sort of literary partnership When a man eminent for experience in learning and in works writes a treatise on his chosen subject he makes his volume the record of his own achievements and a measure of his own knowledge According to his ability as a teacher and the lucidity of his style as a writer such a work becomes valuable as a text book for medical students or a handy reference volume for the desk of the busy practitioner The scope of such work must always be limited since the table of contents is measured by the horizon of one life They reflect however far more clearly the personality of their authors and have an individuality and charm which must always be denied to the more pretentious system which one might call the orphan asylums of medical literature Nevertheless the systems with many parents have far more potential energy than the volumes which own but one paternity where in fact the chapters are often fragmentary and suggestive rather than complete and provide an emergency ration rather than a full meal Medicine and Surgery at the present time have become so highly specialized that it is impossible for any one mind to master the subject or even to be fairly proficient in all its branches sufficient for the needs of the individual if he has a working knowledge of his chosen field and the means of enlightenment where the vastness of the field has left him bewildered and astray It is just here that an eight volume treatise supplements the defects of the shorter works written by individual authors It is their part to give the full measure of knowledge required by the earnest worker by grouping together in

a harmonious whole the differing but kindred subjects which together make up the complex fabric of modern medicine or surgery

This it is, which is the *raison d'être* of the system with its editors, collaborators or separate authors. Each subject in a system of surgery should be exhaustively treated, but it is precisely this which requires that the work should be apportioned among different men, each author a man who has largely devoted his life to his subject and therefore best qualified to write exhaustively because of special knowledge and special opportunity. On the other hand, a work of this character, unless judiciously edited may be badly balanced, with chapters of unequal merit and learning and style so motley that while we appreciate the business acumen of the publisher, nevertheless we are compelled to sympathise with the editor. Of the present system no one to whom the senior editor is well known will venture to predict such a quality. His reputation for learning and decision forbid us to anticipate in these volumes anything save the best that the profession of this country can offer. Nor are we disappointed as we review volumes I and II now in print.

Volume one is largely devoted to the discussion of what may be termed the basic facts of surgery. The introduction is an interesting chapter by the venerable Stephen Smith on the history of American Surgery. When a man of 86 years of age, the Dean of American surgeons discourses of the history of the art in this country we can say of him what his modesty forbade him to say of himself "*Magna pars fui*"

The chapter is largely one of personal reminiscences and therefore of twofold interest. The chapter on inflammation sets forth the modern view of what the older surgeons regarded as a disease in itself, when it defines the process as one which is adaptive, protective and reparative. In a few words this sentence states the difference between the older pathology and the new. Chapters follow on disturbances of nutrition, on certain special infections and on tumor formation. There are two points of view from which we may regard the facts of tumor formation, the purely pathological and histological and the clinical and experimental. The chapter on the histology and theory of tumor formation treats the subject from the first standpoint with almost the completeness of a special work. Cohnheim's theory is re-

spectfully spoken of as the most brilliant hypothesis concerning the origin of tumors ever advanced. Why a hypothesis which has absolutely failed to explain the cause of the overgrowth should be so characterized is an enigma. A hypothesis is valuable alone in proportion as it explains and accounts for certain facts and in medicine or surgery offers us a scientific basis for therapy. In cancer it is not so much the character of the cells which concerns us as their overgrowth and the toxæmia which the disease produces irrespective of mere nutritional disturbance dependent on a disturbed function mechanically interfered with. The difficulty with the brilliant theory of Cohnheim and other kindred is that they concern themselves with the character of the cells but not at all with the most vital problem of cancer the cause of the overgrowth. No theory which loses sight of this factor in the problem deserves commendation. Such theorists have been but blind leaders of the blind. Up to the present time they have offered us no basis for rational therapy nor have they taught us how we are to live so as to avoid the disease. When we turn to the clinical and experimental method of investigation we may at least bid ourselves hope. What surgeon is there who has not met with utter defeat in his attack on this most fiendish of diseases? Who is there who has not seen his patient succumb either because the disease was inaccessible surgically or in spite of the most painstaking and radical work? We all mourn our defeats which alas outnumber our victories. We used to think the three year limit safe. Now we have been obliged to advance it. Slys McCormick of England. Call no woman cured of cancer until she is dead. Baldy states that less than 5 per cent of cases of cancer of the cervix are cured. Yet no phase of the disease has been the subject of more persistent and careful attack. What comfort is there for us after all in Cohnheim or Ribbert? They leave us where they found us in the mire of defeat and hopeless defeat. No surgeon however can read this chapter of Gaylord's without a reawakening of hope in his heart. If tumors known to be malignant can be transplanted with 100 per cent of successes in animals this fact in itself is sufficient to remove us from the benumbing influence of purely histological theories. Gaylord may not have discovered the cause of cancer but his work and that of others working along similar

lines has done much to rid the atmosphere of dense mists and shadowy hypothesis. If in addition it can be shown that some mice recover from the malignant mice tumors and that such mice can never again be successfully inoculated and that the sera of such mice has an inhibitory effect on the tumors of non immune mice, experimental pathology will have done much to furnish a sound basis for therapy. Let it once be established that cancer is contagious and the incidents concerning infected cages related by Gaylord seem to warrant such a supposition and we shall have advanced a long way toward the solution of the problem. As we read Gaylord's account of his work in the Buffalo Laboratory for Cancer Research we cannot but feel encouraged for the future and we confess to a feeling of admiration and sympathy for the tireless workers who pursue their quest undismayed and undisturbed despite much unfriendly and some unjust criticism. May they reach their goal! The chapter on Surgical shock will disturb many old notions as to the efficacy of remedies which all of us have used in this condition. It is to be regretted that we are not offered anything very tangible in exchange. The chapter on general surgical diagnosis is the fruit of close observation and wide clinical experience. It is a monograph which ought to be put into the hands of every medical student when he graduates.

The increasing importance of the Rontgen ray both from the diagnostic and therapeutic standpoint is emphasized by the length and excellence of the chapter devoted to its consideration. Of especial importance is the section devoted to its interpretation.

Volume two opens with a chapter on the surgery of what may be termed the tropical diseases. It also treats of anthrax, glanders and actinomycosis. Other chapters follow on the surgical disorders associated with syphilis and tuberculosis, those twin spectres which accompany poor humanity from the cradle to the grave. Other chapters treat of the surgical disorders of the skin, muscles, tendons, nerves, lymph nodes, etc. Burns produced by the electric current are dealt with in a special chapter and the volume concludes with a long and informing chapter on bullet wounds. The reader is here given the latest knowledge possessed on this subject by an expert who has been familiarized with the effects of modern high powered projectiles by actual service. Space forbids more extended discussion of individual

chapters All are written by men who are authorities in their specialty Much of the matter is new and all of it valuable

The editors are to be congratulated on their work They have chosen their collaborators wisely and have together wrought a work which is a credit to the science and art of Surgery as practiced and taught on this continent

ALGERNON THOMAS BRISTOW

A MANUAL AND ATLAS OF ORTHOPEDIC SURGERY By JAMES H. YOUNG P. Blakiston's Son and Co. Philadelphia Pa.

This very comprehensive work exhibits the result of the extended experience of the author and also a studied presentation of the subject The arrangement is a logical one and the text very readable The selection of illustrations in this as well as in many other treatises of the present day is open to criticism Although a great advance has been made by substituting artistic photographs for crude drawings yet it would seem that too much space is sacrificed for a finished product of art without a sufficient teaching value to compensate for the increased bulk of the volume Another frequent fault of the medical illustrator is the depiction of the extremes of deformity and disease What the reader wants is an aid to early diagnosis—such as the author gives in some of these pictures of attitude in spinal caries The book is profusely illustrated and the illustrations are well done in fact the whole work is a good example of the printers art It is well worthy of a place in the library of the general practitioner as well as the specialist

After an opening chapter on the history of the subject the author takes up the general etiology and pathology of deformity with its symptoms and diagnosis all of which are most instructive Considerable space is then given to prophylaxis and general treatment in which is concisely stated the different methods employed for mechanical support and forcible corrections A chapter is devoted to tenotomy with a brief outline of tendon and nerve transplantation

The chapter on Potts disease is comprehensive with all points well illustrated In the treatment of abscesses however the author hardly lays sufficient stress upon the value of the expectant or conservative side Following the discussion of tuberculosis

of each joint, the non tuberculous affections are well covered. The subject of hip disease is also thoroughly gone into with a discussion of the various methods of treatment. Most of the chapter on non tubercular disease of the hip is devoted to coxa vara, that condition receiving fuller treatment than in any other orthopedic work except Whitman.

Lateral curvature receives the extended discussion which it demands. Not as much space, however, is given to the surgery of paralysis as the comprehensiveness of the treatise would lead one to expect, but otherwise the varied forms of paralysis are carefully explained and illustrated.

The subject of acquired valgus or weak foot receives too little attention considering the prevalence and importance of this disability—no mention being made of the Whitman arch support. Much greater space is devoted to congenital dislocation of the hip which is instructively dealt with in diagnosis and the different operations for reduction.

Although many criticisms have been made, yet this manual of orthopedics will be found of great interest and value, of help to the physician as well as the student of Orthopedics.

CHAS. DWIGHT NAPIER

PRACTICAL GYNECOLOGY A Comprehensive Text-book for
Students and Physicians By E. E. MONTGOMERY, M.D.
LL.D. Third Revised Edition Philadelphia P. Blakiston's
Son & Co., Publishers, 1907

In the preface to the first edition of this work (under date of August, 1900), the writer states that the work has been under consideration for fifteen years and much of it had been rewritten several times. An effort was made "to make it a comprehensive work upon the subject, giving the experience and methods of the most careful men, while my own experience has been utilized to indicate that which I have found most useful and worthy of acceptance."

In the second edition, appearing in 1903, such changes were made as are necessary in the natural growth of the subject and, as from experience with the previous edition, the author thought would prove of benefit to the student.

The present edition represents another careful revision of

the subject paying special attention to microscopic diagnosis gynecic bacteriology and the pathology of uterine cancer

One of the best features of this work is that each general subject as far as feasible is considered with reference to its influence upon the entire genital tract thus giving a more comprehensive view of each subject than when each organ and its diseases are studied separately. This work has been and still is one of our best text books and we welcome the present edition

J A SAMPSON

- I DIE BEHANDLUNG DER TUBERKULOSEN WIRBELSAULEN ENTZÜNDUNG VON DR F CALOT uebersetz von DR P EWALD
 II DIE BEHANDLUNG DER ANGEBORENEN HÜFTGELENKSVERRÜCKUNG VON DR F CALOT uebersetz von DR P EWALD
 Stuttgart Ferdinand Enke 1907

I This translation has retained much of the vivid and picturesque style of the original brochure. The book deals with the treatment of the Kyphotic Spine of Potts Disease. Calot believes that merely the gibbus of small extent may be straightened. This is to be accomplished by redressement. After describing the manner of applying a plaster jacket from the neck to the trochanters embracing the chin and occiput when the gibbus is higher up the method of redressement is detailed. A fenestra is cut out of the plaster jacket to correspond to the gibbus. Over this several pads of cotton are placed to exert a moderate pressure. At the expiration of every 14 days the pads are renewed and their number increased until the deformity is obliterated. The pads are held in place by circular turns of dextrine bandage. A feature of this Calot jacket is its construction out of large layers of dextrine gauze steeped in plaster cream which are moulded to the form. A large window is cut out of the front of the jacket. Emphasis is placed upon the necessity of extension—but not suspension—in applying the jacket. To some extent the case is passed upon as healed by the alignment of the spinous processes in the radiogram. A jacket is worn five to six months and is then renewed or a celluloid corset moulded to the cast made from a model of a plaster jacket. Calot is very enthusiastic in his recommendations of the injection of iodoform oil and camphor naphthol for the treat

ment of cold abscess and sinuses in connection with spondylitis. The iodoform is preferred for the well defined abscesses, the camphor naphthol for those in a fungating condition. As many as a dozen injections are made at intervals of a week.

For the complication of paralysis Calot recommends no treatment other than a well fitting plaster jacket.

The instructions are so explicit and the illustrations so numerous and well represented that it should be an easy matter for the practitioner to acquire this technique.

II The original of this work appeared in the French language. It was so replete and exacting in its detail, and based on a practical application in so large a number of cases (443), that it suggested itself to Dr. Vulpius that it would be very desirable to possess a German translation to supplement the German writers on Bloodless Reduction of the congenitally dislocated hipjoint, who were the pioneers in this method.¹

The two introductory chapters are devoted to the early diagnosis of congenital dislocation, emphasizing a scrutiny in the gait, examination in the erect and recumbent posture. Acquired forms of dislocation due to traumatism, osteomyelitis, typhoid fever, and paralysis, are differentiated by the history of their onset. The prognosis is hopeless in untreated cases. Children under 7 years of age, if properly treated, are always cured. Between the ages of 7 and 12 a cure can be effected in 90 per cent of the cases, wherefore reposition is always to be attempted. In children between the ages of 12-15 reposition is possible in three out of every four cases. Beyond the age of 15, reposition is difficult and possible occasionally if preceded by a long period of extension. In bilateral dislocations the age limits of reposition have to be lowered by two to three years. Emphasis is placed upon proper "Reposition." If the latter has been effectively done, we have at the present day means at our disposal to maintain the reposition.

The remainder of the book is divided into two parts. Part one is given to a consideration of the technic of reposition embracing the manœuvres, the application of the plaster of Paris bandages, and the after treatment. It is possible if one is very accomplished in the technic, and certain of reposition to effect a cure with a simple application of a plaster of Paris bandage. A better control of the position is possible by a reapplication at the

end of two months and for similar reasons a third bandage is to be applied

The after treatment embraces correction of the thigh the position of the kneejoint and the lordosis. Active motions alone are to be relied on to restore mobility of the hip. The muscles to be strengthened by massage.

If a relaxation is encountered anteriorly a new reposition with flexion of 60° and 30°–50° abduction is recommended for posterior relaxations an abduction of 90° is necessary.

The second part of the book is devoted to a consideration of the various chemical forms of the unilateral and bilateral dislocation.

In speaking of the results in the 15th chapter author claims 100 per cent cures in the last 100 cases. In children beyond 10 years of age who are treated a rigidity of the joint may result and even where transposition follows reduction a better functional result is obtained. Severe relaxations are not to be encountered if the technic of forced abduction and hyperextension advocated by Germans is abandoned. Without fear of exaggeration in the early treated cases one can speak of a radical cure as does the surgeon in the radical cure of hernia.

The significance of radiogrammes is thus stated. The Röntgen rays have contributed to the development of the technic so that we can now apply the technic without having refuge to the X rays at all times in the average case.

The concluding chapter covers the operative treatment of cases not amenable to reposition. Hoffa's operation is passed upon as being a formidable procedure with but moderate success at the best. Senger's operation is regarded as less severe but the reposition is incomplete. Calot characterizes his open operation of small incision and dilatation of the capsule with subsequent reposition of the head as being on a par with tenotomy in all other respects like the bloodless reduction.

The concluding chapter embodies the palliative treatment of irreducible dislocations. Either with the aid of orthopedic appliances or by successive application of plaster of Paris spicas the gradual correction in whole or in part is effected.

The aforesaid is an epitome of the narrative embodied in the 271 pages of this book. It has been the author's aim to outline the treatment with all the precision it requires so as to

be available for the practicing physician. In this respect, the work is far too comprehensive. The 206 illustrations afford a most graphic presentation of every manipulation, and the radiographs are of the best. A translation in the English language of this practical monograph is devoutly to be wished.

MARTIN W WARE

GYNECOLOGY AND ABDOMINAL SURGERY. Edited by HOWARD A KELLY, M D, Professor of Gynecologic Surgery at Johns Hopkins University, and CHARLES P NOBLE, M D, Clinical Professor of Gynecology at the Woman's Medical College, Philadelphia. Large octavo, 851 pages. Philadelphia and London. W B Saunders Company. 1907.

Volume I of this treatise is a marked addition to the literature of its subject. While it shows forcibly the intimate relationship between gynecology and abdominal surgery, it tends to demonstrate still more forcibly that gynecology is simply a branch of general surgery and should always be considered as such. The editors in their preface call the general surgeons their "competitors, and generous critics," and say that "they (the general surgeons) will not deny that the great advances made in the gynecologic field have constituted the very backbone and the marrow of the abdominal surgery of to-day." No doubt those who have at first devoted themselves exclusively to operations upon the uterus and adnexa will view the field from this standpoint, but, as in the present case, it is often these very men themselves who have seen the narrowness of their field and have rapidly reached out, claiming the bladder, the rectum, the ureters, the kidneys, the appendix, and even the diseased breast, as within the field of gynecology.

In one of the greatest and most brilliant books of recent date upon the subject of Operative Gynecology, there appears a chapter on the Radical Cure of Hernia and a chapter on Intestinal Suture. Is this not abdominal surgery? It is evident that the surgeon must first become proficient in general surgery before he devotes himself to gynecology. Gynecology has become what it is to-day because general surgeons have entered on its domain.

The present work is edited by Howard A Kelly of Baltimore and Charles P Noble of Philadelphia. The various chap-

ters are written entirely by American authors. Three of the collaborators Drs Alexander J C Skene Wm R Pryor and Ferdinand Henrotin have died during the preparation of the work.

The first volume is devoted strictly to gynecological subjects. There are many interesting features. The chapters on the bacteriology and pathology of gynecology by William Ford and Elizabeth Hurdon are the most extensive that have yet appeared on the subject. There is a chapter devoted entirely to medical gynecology which is a fitting compliment to the surgical considerations. The remainder of the book takes up in detail gynecologic technique and gynecologic operations. In a number of instances where differences of opinions concerning the relative advantages of the abdominal and of the vaginal route for the performance of operations have existed advocates of each side have been chosen to write upon the subject.

The book is most elaborately illustrated every illustration having been specially made either by Hermann Becker or Max Brodel whose work has yet to find their equal. They are anatomically accurate and beautifully executed.

PAUL M PILCHER

CORRESPONDENCE.

SUBSEQUENT REPORT ON A CASE OF SEVERE SPINAL CORD INJURY, SYMPTOMS OF COMPLETE SEVERANCE OF THE CORD

EDITOR ANNALS OF SURGERY

In the November, 1906, number of the ANNALS, I reported a case of dislocation of vertebræ in the lower cervical region, followed by symptoms of complete severance of the spinal cord. The operation of laminectomy was performed by Dr Roswell Park of Buffalo, fifteen days after receipt of injury, and at the level of the 6th cervical segment the cord was found to be flattened so that it did not nearly fill the canal. There was a small remnant of an old clot within the dura. On lifting the cord with an artery needle, it seemed flattened, ribbon-like, shrunken, and to lack in bulk. The patient made a slow, continuous improvement, able to move the feet a little, and considerable improvement in sensation, in the hands and arms not much change appeared. He left the hospital about four weeks after the operation. Considerable later improvement is evidenced by the following letter received on August 8, 1907

WELLSVILLE, N Y, Aug 6th, 1907

DEAR DR KRAUSS

I thought I would write you a few lines and let you know that I am working again at my old trade (operator). I am back in the office and can do the work all right now, does not tire me hardly any, and am feeling fine.

I seem to be gaining right along, but of course it is very slow. Cannot get around alone, but can get around the house with help of some one, just enough help to steady me. Cannot hold balance well enough to go alone, but have walked ten or fifteen feet alone by using cane.

The continued improvement in the case is sufficient evidence to prove the advisability and necessity of operation in cases of spinal cord injury, even if the reflexes are totally absent, the bladder and rectal sphincters paralyzed, complete loss of motion and sensation, and even with a moderate degree of cystitis and beginning bed sores present.

WILLIAM C KRAUSS, M D,
Buffalo, N Y

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ANNALS OF SURGERY

A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY
LEWIS STEPHEN PILCHER M D LL D
OF NEW YORK

WITH THE COLLABORATION OF

J WILLIAM WHITE M D LL D	SIR WILLIAM MACEWEN M D LL D
OF PHILADELPHIA	OF GLASGOW
Professor of Surgery in the University of Pennsylvania	Professor of Surgery in the University of Glasgow

W WATSON CHEYNE C B F R S
OF LONDON
Professor of Surgery in King's College

VOLUME XLVI
JULY—DECEMBER 97

PHILADELPHIA
J P LIPPINCOTT COMPANY
1907

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1907

CONTRIBUTORS TO VOLUME XLVI

ANDREWS E WYLLYS M D of Chicago Ill Professor of Surgery in the Northwestern University Medical School

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THE SERUM TREATMENT OF EXOPHTHALMIC GOITRE

Harriet C B Alexander (in *The American Practitioner and News*, August, 1907) discusses the subject and reports thirteen cases. Four principal theories of the disease have been advanced (1) That it is due to disease of the sympathetic nervous system, (2) that the seat of the malady is the medulla oblongata, (3) that it is primarily a disease of the thyroid gland, and (4) that it is a neurosis.

Modern therapeutic measures have been largely based on the "thyroid" theory. The results of partial strumectomy indicate that the successful removal of a portion of the thyroid gland can lead to cure or to definite amelioration of the condition. On the theory that the thyroid secretion normally neutralizes certain general metabolic poisons in the body, Moebius and others conceived of treating cases of exophthalmic goitre, in which there is presumably an excess of thyroid secretion in the body, by introducing subcutaneously, or by the mouth, the serum of thyroidectomized animals. It was hoped that the non-neutralized general metabolic poisons of such animals would nullify the toxic effect of the excessive thyroid secretion. As to the treatment, experience has shown the great importance of general measures: complete rest for a time, fresh air, careful diet, mild balneotherapy, etc.

The name Thyreoidectin has been given to a preparation obtained under aseptic precautions from the blood of animals from which the thyroid glands have been removed, and which is exhibited as a reddish-brown powder contained in capsules, usually five grains each. Carefully conducted clinical trials seem to show that Thyreoidectin can be depended upon to control the characteristic symptoms of exophthalmic goitre. In most cases the patient experiences much relief from the restlessness, tremors, insomnia, and other nervous symptoms so frequently present, and a gradual lessening of the frequency of the pulse rate, decrease in the size of the glands, and a diminution of the exophthalmos, with an increase of weight and a much better condition generally. The dose of Thyreoidectin seems to be one or more capsules after each meal, according to the judgment of the physician and the reaction of the patient.

In nine of the author's thirteen cases the size of the gland was materially reduced,

and in every case improvement was observed with respect to one or more of the symptoms.

GOT HIS ANSWER

The victim of the dentist held up his hand. "Doctor," said he, "before you put the lid on my conversation, will you answer a question?"

"Yes," said the dentist, selecting a square piece of rubber and snipping it with his scissors.

"Do people chew more on one side of the mouth than the other?"

"Sure," said the dentist, picking up the clamps.

"How interesting! Which side?"

"The inside," replied the dentist, slipping the rubber dam over the verbal one that issued from his patient's lips.

—December Lippincott's

SPEAKER CANNON EXPLAINS

"Uncle Joe" Cannon and a friend were one day discussing the wild doings of a young Chicago man with whom both were well acquainted.

Mr Cannon's friend was inclined to be very severe in criticism of the sower of wild oats, but "Uncle Joe" had more to say of his good than his bad qualities, remarking that at heart the boy was "all right." He thought it would be well to reserve judgment and give the lad a chance until he reached the age of discretion.

"At just what period would you place the attainment of discretion?" asked the friend quickly.

"Generally speaking," added "Uncle Joe," "I should say that a young fellow has reached the age of discretion when he removes from his walls the pictures of actresses and substitutes therefor a portrait of his wealthy bachelor uncle." —December Lippincott's

PREPARATORY TREATMENT

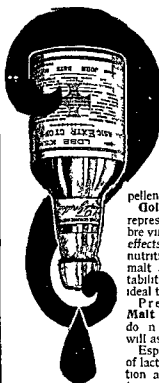
The surgical patient that is burdened with a retention of the toxic products of metabolism is in poor condition, indeed, for an operation. The customary cathartic is not calculated to do more than empty the bowel, and it should be more generally appreciated that the blood is best depurated through the kidneys. A good renal eliminant like Alkalithia is often an ideal preparatory treatment, especially in the well-to-do, and should be more often used before operating, where time permits.



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Dr Pettangill, of New York City, under the head of "Intestinal Antiseptics," reports some excellent experiences, from which the following is selected:

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The pain and burning are relieved to a marked degree. Salol neutralizes the uric acid and cleans up the urine. This remedy is a reliable one in the treatment of diarrhoea, enterocolitis, dysentery, etc. In dysentery, where there are bloody, slimy discharges, with tormina and tenesmus, a good dose of sulphate of magnesia, followed by two antikamnia & salol tablets every three hours, will give results that are gratifying."

A TIMELY WORD FOR THE NURSE

Are the nurses you engage all that you would have them be? Are you perfectly satisfied with their work and ability? Perhaps so, but you would desire that they continue always to be that way, would you not? In fact, progress as you do, is it not so? You learn from your journals the latest methods in modern medicine, the advances being made here and there, but what about your nurse? It is just as essential that she too advance with the times, or the first you know there will be an urgent need of a more competent bedside assistant. In this connection we cannot recommend too highly the *American Journal of Nursing*. There are journals, and journals, and JOURNALS for a nurse, but this is a *real* journal. It is fearless yet conservative, progressive yet stable, and withal advocates nothing but what is of real benefit to both the nurse and the doctor.

If you have never seen a copy write the American Journal of Nursing Company, 227 South 6th Street, Philadelphia, they will send you one free, and you will insist upon your nurses taking it after you read it.

THE ONLY PERFECT COUPLE

She was a widow and her second venture was a widower. He was a gentle soul and had n't much to say in response when his wife had a great deal to remind him of, especially when she compared him with her former, but when he did speak it counted. One night he went to sleep while she was telling him the old, old story. She followed him shortly. Along in the middle of the night she was awakened by his uneasy turning.

"John," she said, "Are you awake?"

"Yes, Susan," he replied softly.

"What's the matter?"

"Oh, nothing, Susan, I was just thinking if your first had married my first they would have been the only perfect couple on earth."

Then he went to sleep again—while she was talking.

—December Lippincott's

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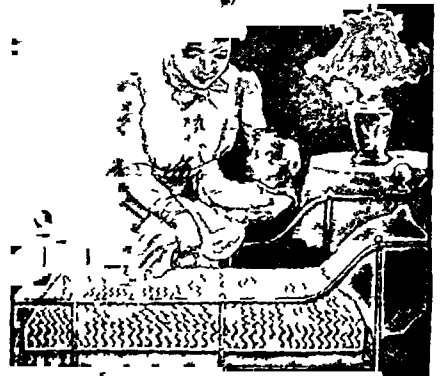
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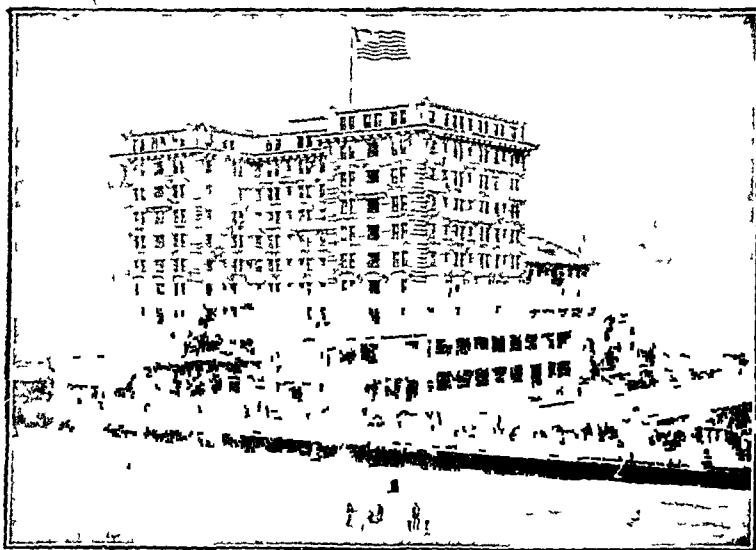
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